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Price, Waterhouse & Co.

Report of Price,
Waterhouse & Company...

[Harrisburg, Pa.]

[1914]

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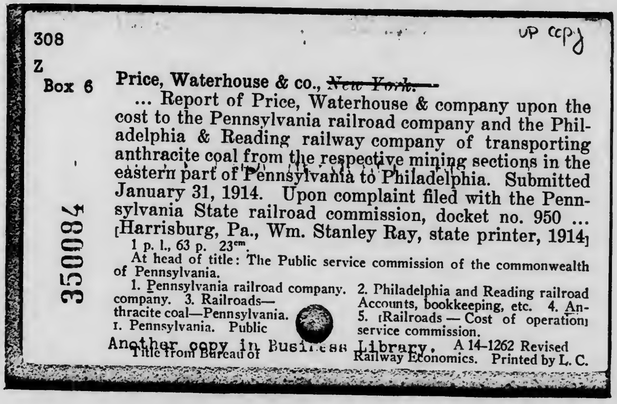

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Price, Waterhouse & co., ~~New York.~~

... Report of Price, Waterhouse & company upon the cost to the Pennsylvania railroad company and the Philadelphia & Reading railway company of transporting anthracite coal from the respective mining sections in the eastern part of Pennsylvania to Philadelphia. Submitted January 31, 1914. Upon complaint filed with the Pennsylvania State railroad commission, docket no. 950 ... [Harrisburg, Pa., Wm. Stanley Ray, state printer, 1914]

1 p. l., 63 p. 23cm.

At head of title: The Public service commission of the commonwealth of Pennsylvania.

1. Pennsylvania railroad company. 2. Philadelphia and Reading railroad company. 3. Railroads—Accounts, bookkeeping, etc. 4. Anthracite coal—Pennsylvania. 5. [Railroads — Cost of operation] I. Pennsylvania. Public service commission.

Another copy in Business Library.

Title from Bureau of Railway Economics. Printed by L. C. A 14-1262 Revised

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TECHNICAL MICROFORM DATA

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THE PUBLIC SERVICE COMMISSION
OF THE
COMMONWEALTH OF PENNSYLVANIA

REPORT OF
Price, Waterhouse & Company
upon the cost(*) to the
Pennsylvania Railroad Company
and the
Philadelphia & Reading Railway Company
of
transporting anthracite coal
from the
respective mining sections
in the eastern part of Pennsylvania
to
Philadelphia.

SUBMITTED JANUARY 31, 1914

Upon complaint filed with the
Pennsylvania State Railroad Commission
Docket No. 950.

EXCERPTS FROM REPORT:

(*) "This cost, as we have remarked, consists of (1) Operating Expenses; (2) Taxes; (3) Hire of Equipment, and (4) Miscellaneous Items, for the period of twelve months to May 31, 1913."

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HARRISBURG, PA.:
WM. STANLEY RAY, STATE PRINTER
1914

[illegible]. C. M. Mich. 18-15

PRICE, WATERHOUSE & CO.
54 William Street,
NEW YORK.

January 27, 1914.

The Public Service Commission
of the
Commonwealth of Pennsylvania,
Harrisburg, Pa.

DEAR SIRS:

We were instructed by the Pennsylvania State Railroad Commission, under date of May 9, 1913, "to make an examination of the books, records, letters, contracts, papers and operations of the Pennsylvania Railroad Company and the Philadelphia & Reading Railway Company, and ascertain therefrom, and from any and all other sources of pertinent information, what is the cost to each of these companies of the transportation of anthracite coal from the respective mining sections in the eastern part of Pennsylvania to Philadelphia."

Accordingly on May 16th, we commenced examinations at the offices of each of the two companies concurrently, and having carried them out with all the diligence that the nature of the work has permitted, we now have the pleasure of reporting to you on the results of our examinations.

In this report, we shall first submit as briefly as possible, along with a discussion of the general principles involved, our determination of the cost of the transportation of anthracite from the mining districts to Philadelphia, and the significance of the cost figures as determined. We shall then proceed with the explanation of the manner in which the cost figures were derived.

To establish an adequate basis for the determination of the cost of transportation, the accounts for the twelve months ending May 31, 1913, were selected. We have assumed that the accounts have been kept under the classification prescribed by the Interstate Commerce Commission and we have accepted them without audit as being substantially correct.

GENERAL OUTLINE OF PRINCIPLES AND SUMMARY OF RESULTS.

The Relation of Cost to Revenues:

The revenues earned by a transportation company for services, and the net income accruing to it from sources other than revenue for services, provide the fund out of which the cost of the services is to be defrayed, compensation is to be given to the investors for the use of the property employed in the rendering of the services, and a return on the amount invested in securities or property not used in operation, is to be provided. The Income and Profit and Loss Accounts of the company record the accumulation and distribution of this fund.

Revenues should provide both cost and fair return on investment:

It has come to be generally accepted—so generally that it need not be argued here—that a company has the right to charge rates sufficient at least for the revenues to provide for the cost of the services together with a reasonable return on the investment in property employed in rendering the services. It will probably be recognized when the question will have been more exhaustively considered that a company is entitled to recover through its earnings an adequate provision for capitol losses (such as abandonments), sustained in connection with the progress in the art of transportation, investments in unremunerative betterments, such as ornate station construction, beautification of line and grounds, and other like improvements carried out to satisfy public demands. Possibly other provisions may be suggested for which earnings should provide. In any case, where rates are being considered from the standpoint of cost value, it is necessary first to determine the actual cost of the service and after this is done the necessary provision for return on the investment in the property and whatever other provisions may be deemed equitable can be taken into consideration. Our inquiry has, however, been restricted to the question of operating costs and we have not dealt in any way with the question of investment and return thereon.

In this report we shall use the term "cost" when referring to actual operating cost exclusive of interest or return on investment and "cost value" to represent the value based on cost but including return on investment.

Determination of the Costs of a Specific Service:

While the cost of the transportation services as a whole is readily derivable from a company's Income Account, assuming the latter to be correctly prepared, the cost of a specific class of service involves under present accounting methods more or less laborious separations of the cost of the whole as among the various services rendered.

The cost of one of the several classes of service performed wholly or in part by the same organization or with the same facilities is incapable of absolute determination whether in railroad or in industrial practice. Approximations can be obtained by assigning to each service the expenditures directly occasioned thereby and apportioning other expenses as equitably as possible among the several services which share the benefits arising therefrom. The more closely expenditures are related to individual services the more accurately as a rule such apportionments can be made. Some expenditures, such as those of general administration, are only distantly related to the individual services but they must be met by the services in the aggregate and an apportionment must, therefore, be made even though it may be on a basis which is conceded to be arbitrary and inexact.

In undertaking the apportionments necessary for the determination of costs of specific services there is opportunity for perfectly reasonable differences of opinion as to methods. Two fundamental bases which have received general consideration are (a) that each class of transportation is a coordinate part of the service as a whole and should bear a fairly proportionate share of the expenses common to it and other classes of service, and (b) that certain classes of service are secondary in character and should bear in their cost only the additional expenses directly occasioned by their performance. This latter principle, which is sometimes described as the "additional cost" principle, has we think undoubtedly a fair application to incidental services, such as storage, lighterage, train and station privileges, etc. Whether it can fairly be applied to the services of transporting passengers and freight, and if so to what extent, are more difficult problems involving large questions of public policy upon which there is much difference of opinion amongst economists and railroad authorities.

The considerations affecting the question are clearly different in the cases of traffic carried for less than cost value (a) by governmental order or with governmental sanction; (b) at the maximum rates obtainable having regard to competitive conditions; or (c) at rates voluntarily made less than the traffic will bear.

Under these circumstances we have not attempted to make any allowance for the application of the principle of additional cost in the determination of the cost of services rendered by the railroads. We would, however, draw the attention of the Commission to the possible importance of the question as indicated by comparative figures of revenue and expenses.

In the case of the Philadelphia & Reading Railway, records of revenues by divisions are not maintained, but in the case of the Pennsylvania it appears that in the aggregate the revenue of the divisions involved in the anthracite coal traffic amounted for the year under consideration to $73,917,654.00, and the operating expenses amounted to 71.25% of the revenues, leaving 28.75% to provide for return on investment and for any reserves for extraordinary purposes. Whilst there are no figures as to the value of the investment now available, it seems probable that such a percentage would not be greatly if at all in excess of a fair return. Consequently, if one or more classes of traffic yielded substantially more than a strictly proportionate share of the operating costs and return on investment, other services must have yielded less than a strictly proportionate share thereof. We have not attempted to ascertain to what extent such a condition existed, or to how far it was attributable to voluntary action on the part of the railroad, and how far to conditions which the railroad was powerless to change.

We would also point out that even though the additional cost principle should be regarded as not properly applicable to any part of the transportation services of a railroad, yet when, as in the present case, the question of rates is being considered on the basis of the actual operations of a past period then if services were in fact rendered during that period for less than their cost value, the effect of such traffic on the cost value of other traffic should receive some consideration. To the extent that common expenses have been apportioned to any class of traffic the existence thereof has tended to reduce the cost value of all other traffic, and if the resulting cost value of any class of traffic is greater than the revenue that can be obtained therefrom, the cost value of the remaining traffic should be adjusted, the measure of the adjustment being in theory which-ever is the lower of—

(a) the increase in the share of common expenses and return on investment assignable to the remaining traffic as a result of the discontinuance of any traffic yielding less than its cost value; and

(b) the deficiency as between cost value and revenue on the traffic not fully remunerative.

In ascertaining cost of the apportionment of expenses, little weight can be given to cost that is determined by statistical selection alone; that is, by compiling what are thought to be the items properly entering into it. Such compilations when extended to each class of service in turn are likely to account for a total cost of the services as a whole quite different from their actual total cost. To secure reliable cost figures all of the expenses must be accounted for either in the cost of the service in question or in those of one of the other services, and this principle affords the test of the reliability of the final results in that if the separation of each item of expense between two or more classes of service is equally fair to each, considering the question from the point of view of each service in turn, the amount assigned to the service under special consideration may be accepted as fair and the aggregate of the assignments may be fairly taken as the cost of the specific service.

Subdivision of Expenses by Operating Divisions:

It frequently happens that the accounts of a company permit the subdivision of the total cost of transportation among a number of geographical divisions. When this subdivision is available it leads to more precise results, especially when, as in the case of the anthracite question, only certain of these divisions are involved in the particular service. The costs of rendering like services in different territories differ. The cost of a specific service determined as to the entire road is an average. That determined by aggregating the costs on separate divisions is somewhat more precise, especially if the particular class of traffic is unevenly distributed over the road. In the case of the two railroads under consideration, sufficient information as to the subdivision of expenses between divisions has been available to enable us to employ the principle, and in the main to put aside out of consideration the expenses of divisions which are not involved in the transportation of anthracite from the mines to Philadelphia.

Subdivision of Expenses between classes of Traffic.

Rail traffic falls naturally into two main classes, passenger service and freight service. The subdivision is not entirely free from criticism but is the most satisfactory yet proposed and is the one in general use. Its principal merits are (a) the positive one that a large number of expense items are directly assignable as between these two classes, while they must in many cases be apportioned on the basis of relative statistical data as among specific classes of these general ones; and (b) the negative one that no satisfactory common unit of operation to which both passengers and freight can be reduced, has been yet suggested so far as we are aware.

A large proportion of the cost of the total service is directly assignable to one or other of these classes of traffic. The common items such as maintenance of way expenses, superintendence in the various departments, general expenses and taxes and others may be readily apportioned on the basis of data bearing on the use of facilities or as overhead expenses incidental to a department or to the organization as a whole. The principles underlying the distribution of overhead expenses have been for many years recognized in industrial cost accounting, the problem being partly analogous in this respect.

Passenger service cost may be then put aside as having no further bearing on the matter in hand, and freight service cost may be further subdivided among the four classes, merchandise, anthracite, bituminous coal and coke. This carries the subdivision as far as is necessary to deal adequately with the determination of the cost of transporting anthracite from the mines to Philadelphia. The manner of carrying out this subdivision is as in the previous case, the assignment of directly assignable items and the apportionment of the remainder among the four classes on suitable bases.

In the case of the two railroads in question, a considerable proportion of the subdivision of expenses between passenger service and freight service was readily obtainable from the books in proper form. In some particulars, however, we have had to take exception to the methods of subdivision, and in the case of the Philadelphia & Reading Railway, the subdivision is not fully carried out by the company and had to be completed in respect of the divisions affected by ourselves. The subdivision of the cost of freight service among merchandise, anthracite, bituminous coal and coke was for both companies carried out in the main by ourselves on the basis of data secured from the records. So far as we have been able to ascertain, neither company determines the cost of the anthracite traffic separately from other freight traffic, but each secures concurrently a considerable amount of pertinent information.

Derivation of the cost per ton of transporting anthracite from the Mines to Philadelphia:

The subdivisions indicated above result in the determination of the total cost of all anthracite traffic on the divisions that render service in transportation of anthracite from the mines to Philadelphia. The divisions involved are in respect of coal of three classes—(1) coal originating divisions; (2) coal carrying divisions and (3) coal terminal divisions. It would appear to be fair, considering the character of the anthracite traffic on these railroads, to ascertain the average ton mile cost of transportation by division of the total cost by the tons carried one mile and to multiply this average unit cost by the mileage from the mines to Philadelphia. To dispose of any uncertainty as to the propriety of multiplying a ton mile cost which involves mine assemblage and terminal cost, as well as road cost, by mileage, and as to the extent to which any unsoundness in such a course might fail to be neutralized by the fact that the ton mile cost is first derived by employing mileage as a divisor, we have in the case of the Pennsylvania Railroad derived the cost per ton in the terminal division separately and irrespective of mileage, we have calculated the ton mile cost for strictly carrying divisions separately, and we have limited the averaging of terminal expense over mileage to the originating division where the possible error is entirely cancelled by the subsequent multiplication by mileage for the reason that the Philadelphia bound coal has the same average mileage as coal bound elsewhere on this division, except for the negligible factor of coal delivered at stations along the line. In the case of the Philadelphia & Reading Railway we were unable from available data, and considering the movement of traffic, to subdivide divisionally with the same precision, but though the results of the averaging method were consistent, we have further satisfied ourselves as to their substantial fairness by consideration of such data as were available.

It may be remarked that the terminal cost of anthracite traffic is relatively low by reason of its being handled in bulk and usually with mechanical aids. On the other hand, the value of the property employed in its terminal handling is an important item and calls for due consideration in the determination of the fair return that the traffic may be expected to yield.

The anthracite brought to Philadelphia by the Pennsylvania Railroad originates in the Schuylkill, Lehigh and Wyoming districts, and is transported by various routes from its points of origin to Philadelphia subject to scattered movements of small tonnage, as follows:

From the Schuylkill District:

Route 1—From the vicinity of Weigh Scales and Mt. Carmel over the Shamokin, Susquehanna and Philadelphia Divisions, via Sunbury and Rockville.
Route 2—From points on the Lykens Valley Railroad in the vicinity of Williamstown and Lykens to Philadelphia via Millersburg and the Susquehanna and Philadelphia Divisions.

From the Lehigh District:

Route 1—From points on Shenandoah Branch of Sunbury Division to Pottsville, and over Schuylkill Division to Philadelphia.
Route 2—From Mt. Carbon over the Schuylkill Division into Philadelphia.

From the Wyoming District:

Route 1—From points on the Sunbury Division westward over the Sunbury Division to Sunbury, thence over the Susquehanna and Philadelphia Divisions via Rockville.
Route 2—From points on Sunbury Division southward over Lehigh Valley Railroad and Schuylkill Division to Philadelphia.

From the Wyoming and Lehigh Districts:

From points on foreign roads to the Pennsylvania Railroad at various points on the Belvidere & Delaware Railroad, and thence over that railroad and over the New York Division via Coalport.
Route 1—Via Manunka Chunk and Coalport.
Route 2—Via Belvidere and Coalport.
Route 3—Via Martins Creek and Coalport.
Route 4—Via Phillipsburg Junction and Coalport.

The anthracite brought to Philadelphia by the Philadelphia & Reading Railway originates, except for an unimportant tonnage received from foreign roads, in the Schuylkill District, which is served by the Shamokin and Reading Divisions. The southern part of the Shamokin Division and the northwestern part of the Reading Division form, broadly speaking, a great assemblage yard wherein the routes from the several points of origin of the traffic converge. From Port Clinton on the latter division, and over the Philadelphia Division to Philadelphia, all of the anthracite traffic is moved over a single route to West Falls yard in Philadelphia where it is subdivided for local distribution.

The distances from each mine to Philadelphia might readily be dealt with separately and a tabulation of the slightly varying costs might be compiled, but as such a statement would by its very detail tend to confuse the issue, the average distances from the mines to Philadelphia have been ascertained as precisely as we were able to do it for each district and by each of the main routes.

These distances are as follows:

	Miles from Philadelphia.				
	Pennsylvania Railroad.				Philadelphia and Reading Railway.
	Route 1	Route 2	Route 3	Route 4	
Schuylkill District,	187	153	....	....	123
Lehigh District,	104	99	....	....	....
Wyoming District,	218	165	....	....	....
Lehigh and Wyoming Districts,	103	99	93	85	....

The following statement shows the cost per gross ton of transportation during the twelve months ending May 31, 1913, over each of these routes, determined in the manner described in the preceding pages. This cost, as we have already indicated, the revenues must meet before they provide any return for the use of the property employed in operation.

	Cost in Cents per Gross Ton.				
	Pennsylvania Railroad.				Philadelphia and Reading Railway.
	Route 1	Route 2	Route 3	Route 4	
Schuylkill District,	61.043	54.378	....	....	44.698
Lehigh District,	60.613	60.848	....	....	....
Wyoming District,	65.290	77.420	....	....	....
Lehigh and Wyoming Districts,	57.235	55.587	53.114	49.816	....

Having thus briefly summarized the results of our investigation, we may turn to the explanation in detail of the derivation of the cost figures shown above.

RECORDS AND STATISTICAL DATA EMPLOYED IN THE COST DETERMINATIONS.

The Books of the Companies:

The books of each company record the cost of the entire transportation services as a whole rendered by it. This cost, as we have remarked, consists of (1) Operating Expenses; (2) Taxes; (3) Hire of Equipment, and (4) Miscellaneous Items. We have assumed that the books had, in respect of these items and for the period of twelve months to May 31, 1913, been kept substantially in accordance with the prescribed rules of the Interstate Commerce Commission and that they presented correctly the expenses, etc., of the two companies, assumptions which we have not proven but of which we have seen no reason to doubt the correctness.

Subdivision of Expenses by Divisions:

The books of each company show also the subdivision of the total operating expenses by divisions, except that the Philadelphia & Reading Railway does not so subdivide its general expenses. These subdivisions have in general been found reasonable, but in some cases we have found it necessary to disregard them and to adopt others based on more defensible principles. Having arrived at the fair cost of the services as a whole rendered by each division, we have set apart from further consideration the expenses of all divisions not contributing service to the transportation of anthracite to Philadelphia. The divisions that have to be considered in connection with this particular service are as follows:

On the Pennsylvania Railroad:

Schuylkill Division.
Sunbury Division.
Shamokin Division.
Lykens Valley Railroad.
Susquehanna Division.
Philadelphia Division.
Belvideré Division.
New York Division.
Philadelphia Terminal—New York Division.
Philadelphia Terminal—Schuylkill Division.
Philadelphia Terminal—Philadelphia Division.

On the Philadelphia & Reading Railway:

Shamokin Division.
Reading Division (except Colebrookdale and Allentown Branches).
Philadelphia Division (except Philadelphia and Chester Branch).
New York Division (except Delaware and Bound Brook Branches).

The divisional subdivisions as finally adopted, whether made by the companies or restated by ourselves, will be explained in their application to each sub-account of expenses in the section of this report that will deal with the subdivision of operating expenses.

Subdivision of Expenses of Classes by Service:

The books of the Pennsylvania Railroad show the expenses of each division subdivided between passenger train service and freight train service. This subdivision is obtained first by a direct assignment of the expenses as passenger train expenses, freight train expenses, or expenses common to both services, and second, by the distribution of the common expenses between the two classes of service on what have been adopted as sound bases.

The books of the Philadelphia & Reading Railway subdivide the total expenses for each division, except general expenses as among passenger train service, freight train service and expenses common to both services, but no attempt is made to further subdivide the common expenses.

No subdivision, so far as we have been able to ascertain, is made by either company as among classes of freight train service.

We have found that the original subdivisions among the three heads of passenger train, freight train and common expenses, are in the main acceptable, inasmuch as they are in the first two cases direct assignments of expenses incidental to one or other of the two services, or in the last case expenses not directly assignable. We have not, however, in every instance accepted the subdivision of the common expenses as made by the Pennsylvania Railroad, as other methods of subdivision better stand the test, indicated in an earlier section, of the correctness of derivation of specific cost, viz.—under the assignment adopted no class of traffic can be reasonably regarded as either favored or unduly burdened.

Our purpose requires first the subdivision of the total expenses of the divisions as between passenger train and freight train service, and second, the subdivision of the freight train service expenses as between specific classes of service of which one must be the anthracite service. The subdivision that in the present case may be advantageously adopted is among the following classes:

1—Merchandise.
2—Bituminous Coal.
3—Coke (in the case of the Pennsylvania Railroad).
4—Anthracite.

The expenses assignable to passenger train service may be disregarded as foreign to the present investigation, after they have served their purpose of showing themselves to reasonably include all expenses not assignable to freight train service.

The assignment or apportionment of each sub-account of expenses among the several classes indicated, as finally adopted, will be explained in suitable detail in an ensuing section on the subdivision of the Operating Expenses.

Certain statistical data that are needful to the separation of expenses had to be ascertained and scrutinized. The tonnage, car mileage and train mileage statistics will be referred to repeatedly in the course of the report and may advantageously, therefore, be discussed in advance. Other statistical data employed in connection with isolated items will be considered in ordinary course as they are introduced for use.

Tonnage Statistics:

The tonnage data required were as follows:

1. The tonnage of Merchandise, Bituminous Coal, Coke (Pennsylvania Railroad only) and Anthracite, respectively, handled on each division.
2. The ton mileages of each of the four classes on each division.

These statistics were obtainable directly from the records of the companies. The methods employed by the companies to secure these statistical data were studied and found to be adequate. The ton mileage is, of course, as is usual in railroad practice, based in general on the normal routing of shipments, and additional mileage occasioned by obstructed lines or other exigencies of traffic movement is usually disregarded. The practice, howver, has probably no material effect and in any case it is not unlikely that the resulting statistics are more correct effectively than if the extra mileage were considered.

Car Mileage Statistics:

The records of the companies show passenger car mileage and freight car mileage separately for each division. The records of both companies show freight car mileage subdivided as between loaded and empty car mileage over each division, and those of the Pennsylvania further subdivide each of these as between east and west bound traffic. No further subdivision is directly available from the books.

In the subdivision of the expenses incidental to freight traffic among the four classes of merchandise, bituminous coal, coke and anthracite, the most satisfactory methods involve to some extent the employment of the car mileage in each of these services as a factor. As regards the Pennsylvania Railroad, the loaded car mileage in anthracite service on each division was obtained by, first, ascertaining for the entire system from the records the number of carloads of anthracite handled in the period; second, calculating the average load per loaded car by dividing the number of tons of anthracite handled (as shown by the records) by the number of carloads handled; third, calculating the loaded car mileage of each division by dividing the tons of anthracite carried one mile, or the ton mileage, (as shown by the records) by the average load per loaded car. The empty car mileage in anthracite service was obtained by consideration for each division of the return movements of cars used in the anthracite, bituminous coal and coke services. A study of the ore loadings at Philadelphia, of the movements of rough building material, and of the return of anthracite cars loaded with bituminous coal, and vice versa, on the Sunbury and Shamokin Divisions, permitted adequate approximations of the percentages of cars returning loaded on each of the several divisions, which are as follows:

	Coke.	Anthracite.	Bituminous Coal.	Merchandise.
		%	%	%
Philadelphia,	Nil.	2	2	68.62
Schuylkill,	Nil.	2	2	90.15
Susquehanna,	Nil.	2	2	79.86
Shamokin,	Nil.	26.79	26.80	78.19
Lykens Valley,	Nil.	2	2	68.61
Sunbury,	Nil.	60.42	60.43	78.66
New York,	Nil.	2	2	65.71
Belvidere,	Nil.	2	2	75.79

Consideration was given to the fact that coke cars rarely return loaded. The excess of the loaded anthracite car mileage over the mileage of coal cars loaded with other commodities on the return trip, as determined by the percentages, represents the empty return car mileage incidental to the anthracite service.

The total revenue car mileage in anthracite service for the period was ascertained for each division by adding together the loaded car mileage in that service and the empty return car mileage incidental to it.

The total revenue car mileage in bituminous coal service for the period was ascertained for each division in a similar manner, and that in coke service also, except that the empty car mileage in this service was taken as equal to the loaded car mileage as already indicated.

The remaining class which we have called "Merchandise" includes all freight traffic other than anthracite, bituminous coal and coke. The total revenue car mileage in this service obviously, therefore, consists for each division of the entire excess of the total revenue freight car mileage on the division over the revenue car mileage in the anthracite, bituminous coal and coke services.

For the Philadelphia & Reading Railway, the loaded car mileage was determined in the same manner as on the Pennsylvania Railroad, except that the average car load was based on about 97% of the anthracite handled instead of on the entire traffic for the period, it being assumed that the remainder of 3% for which data would have been obtained only with much labor, was of the same average carload weight. It is not practicable to determine the empty car mileage in anthracite service on the Philadelphia & Reading Railway by the method employed for the Pennsylvania Railroad. The conductors' reports (the third week in July 1912, the fourth week in November, 1912, the first week in February 1913, and the second week in May 1913), considered in conjunction with the official mileage statements, enabled us to compile as a test the empty car mileage on each division subdivided between coal cars and merchandise cars. The empty coal car mileage was then with propriety divided between bituminous coal car mileage and anthracite car mileage in proportion to the loaded car mileage to which it was incidental. The sum of the loaded car mileage in anthracite service and the empty car mileage incidental thereto provided the total car mileage in anthracite service.

The total car mileage in bituminous coal service on the Philadelphia & Reading Railway was derived in a similar manner, except that the average car load was obtained from a test covering 10.85% of the bituminous coal handled. This test has been made representative of the entire traffic by there having been embodied in it many typical movements in various portions of the line.

Coke is an unimportant commodity in the traffic of the Philadelphia & Reading Railway and what has been carried has been included with the merchandise in the statistical data.

Car mileage in merchandise service on this Railway also naturally includes as in the case of the Pennsylvania Railroad the excess of the total revenue car mileage in freight service over the revenue car mileage in the anthracite and bituminous coal services.

Train Mileage Statistics:

The revenue train mileage in freight train and passenger train services, respectively, is obtainable for each division from records kept by the companies. The methods employed in arriving at the figures used by the companies for their own statistics differ slightly from those prescribed by the Interstate Commerce Commission in their treatment of mixed train mileage. While we are of the opinion that the most effective method of dealing with mixed train mileage for the purpose of securing revenue train mileage statistics for use in apportioning common expenses is to regard it as half passenger train mileage and half freight train mileage, and have so treated it in securing the data in question on the Philadelphia & Reading Railway, we have for the Pennsylvania Railroad employed the subdivision determined by that company which is based on actual service and not on arbitrary percentages. While the mixed train mileage is relatively somewhat larger in the case of the considered divisions of the Philadelphia & Reading Railway than in the case of those of the Pennsylvania Railroad, the effect of the method is almost negligible in either.

The further subdivision of revenue freight train mileage among the four classes of merchandise, bituminous coal, coke and anthracite is not directly available from the records of the companies and, moreover, is of necessity in some measure constructive for the reason that the four classes of freight do not represent four separate train services. The traffic conditions, however, on the divisions under consideration on the Pennsylvania Railroad are such that merchandise and coal are handled in separate trains to a considerable extent, and to a lesser extent there is a like separation between bituminous coal and anthracite.

The Pennsylvania Railroad classifies the train movement and the commodities hauled in accordance with the character of the freight, the urgency of its delivery, and the points of origin and destination of the shipment, as follows:

Preference Trains.
Local Trains.
Mine Trains.
Slow Tonnage Trains.

Preference Trains:

The preference train carries all perishable, all live stock, all live poultry of less than carload freight, and also carload freight from the first to fifth freight classes inclusive. The cars making up this class of trains are identified by a label affixed thereto reading "Preference Trains," which serves as a notice for preference in road service and delivery at destination. These trains operate almost exclusively in the merchandise service, the exceptions being that in cases where there are not sufficient cars of slow freight consisting of merchandise of the sixth and seventh classes, or of the various grades of coal to make a separate train, they may be attached to one in the preference class. These exceptions, however, occur so seldom, that the preference train may be fairly considered as in the merchandise service only. The preference trains operate on schedule time with the exception that when there is more than a trainload of preference cars, extra trains which haul the maximum excess load, are operated as an advance section of the last train due to leave the terminal during that day. In substantially all cases, particularly in the eastward movement, the trains are made up of loaded cars. On the New York Division the empty cars of the eastward movement for the months of June 1912 and January 1913, amounted to only six-tenths of one per cent., while the westward movement in June amounted to one and six-tenths per cent., and in January to four and one-tenth per cent., the westward empty movement of the excess of the loaded eastward movement over the westward loaded movement being hauled in slow trains.

Local Trains:

The local trains consist of package trains which carry a substantial portion of merchandise in less than carload lots, and shifter trains, consisting of coal and merchandise in carload lots. We were unable to obtain a separation of the package from the shifter trains, but in view of the fact that anthracite transported from the mines to Philadelphia is not carried in this type of train, the total local train mileage may be excluded from that affecting anthracite traffic. In both trains the switching is performed by road crews, and in the package trains the switching of cars to the freight house, and in some instances the loading and unloading, is performed by the train crews. The extra cost of this local service is indicated by the higher rate per mile paid for enginemen and firemen and crews in local freight service.

Mine Trains:

The mine trains operate between the scales, or storage yards, and the collieries. As a general practice the trains leave the storage yards with empties for the mines, returning with loaded cars. As only anthracite is carried the whole cost is a charge against the anthracite haul. At various times merchandise freight, such as mine props, is carried to the collieries, but the proportion thereof to the total is negligible.

Slow Tonnage Trains:

The slow tonnage trains are made up at terminals and junction points with foreign companies, and comprise chiefly cars containing minerals on the eastward haul, sixth and seventh class freight and empty cars. The primary purpose of the slow train is the eastward haul of mineral freight, the transportation of through low grade freight over divisions or to junction points with other divisions on foreign lines and the delivery of shipments at intermediate divisional points for reclassification and delivery to foreign lines, and the return haul of empty cars.

Where coal and other through low class freight is destined for intermediate divisional points, it is generally dropped at distribution points on the division and the final delivery made by local trains.

The marked physical differences of each of these general classes of freight trains may be briefly summarized as under:

The preference trains have an average speed of twenty miles per hour and haul approximately thirty cars.

The local trains will average ten miles per hour including the loss from starting, stopping, and shifting at stations, and haul approximately fifteen cars.

The mine trains average about eight miles per hour, but haul approximately twice as many cars and are affected by the same conditions of starting, stopping, and shifting as the local trains.

The slow tonnage trains operate through runs, the same as preference trains, with an average speed of ten miles per hour, and haul approximately forty-five cars.

While the average speed between terminals of and the number of cars hauled in the preference trains are twice that of the local trains, the speed of the local trains between stations, or while making their run on the road, is about the same as the preference trains. The mine trains make less miles per hour than the local trains, but haul more cars, and have substantially the same amount of starting, stopping and switching, so that this class of train can be held to bear the same relation to the preference as the local trains.

The slow tonnage trains with one-half the speed of the preference trains, have nearly twice the number of cars with a higher total weight per car and are hauled by a heavier type of engine.

To determine precisely the train miles and car miles of each class of trains for the whole period of our examination would have been

laborious, and the time necessary to do so would have been altogether disproportionate to the value of the results thus obtained. Sufficiently accurate results were obtained by using a test period of representative months during which the ratios of the ton miles for each of the commodities were approximately the same as those for the annual business. The months selected were June and December for the Belvidere Division, and June and January for all the other divisions.

The company does not compile concurrently in its general offices any data in which the train and car miles are segregated to the various classes of trains, but statements are prepared in the divisional operating offices which show the slow tonnage train miles, and on some divisions a segregation is made between the car miles of preference, local and slow tonnage trains.

On each division a daily report is received from each conductor operating upon that division, showing the class of the train and the number, point of origin and destination of cars in the train, from which the statistical data already mentioned is prepared for divisional use. For our purpose it was necessary to compile from the conductors' reports the train miles and car miles on each division of the various classes of trains, at the same time showing separately the train and car miles made on other divisions.

The mileages made by each class of freight train were grouped as follows:

As the preference trains haul only merchandise freight and the local trains merchandise and coal, the latter commodity being for local delivery and not in Philadelphia, they have been classified as merchandise trains.

Mine trains on the divisions under consideration operate only in anthracite producing districts and have been classified as belonging to that service.

Slow tonnage trains have a diversified freight traffic. To obtain a train mileage proportion applicable to each of the commodities under review, the car miles in preference and local trains were deducted from the total merchandise car mileage, and the percentage of the balance to the total car mileage in slow tonnage trains applied as the proportion applicable to merchandise commodities. The car miles of mine trains were deducted from the total anthracite car mileage, and the percentage of the remaining anthracite mileage to the total mileage in the slow tonnage trains applied as the proportion applicable to anthracite. As bituminous coal and coke are carried almost exclusively in slow tonnage trains, the percentage that the total mileage of each of these commodities bears to the total mileage of slow tonnage trains was applied to them, respectively.

The method used in compiling the respective freight train miles on the Pennsylvania Railroad were not applicable in the case of the Philadelphia & Reading Railway, as the trains are not so clearly distinguished nor do the records show sufficient data by which precise statistics can be prepared. We were able to make an arbitrary separation which may be used to derive a reasonable cost, as follows:

From the conductors' reports for all trains run on the branches affected for the same period of time as that used in determining the empty car miles, we were able to get the average number of cars, both loaded and empty, in a solid coal train, a solid merchandise train and a train including cars of each class. For the purpose of these calculations all cars of each class, whether in solid trains or mixed, were combined and divided by the proportionate number of trains. The results obtained showed the average lengths of a coal train and of a merchandise train, and by dividing the total respective car miles by the average for each class, the quotients represented the approximate train miles of each class.

In separating the coal train miles between anthracite and bituminous coal, consideration must be given to the differences in cargo weights in the respective services. The average cargo per car of bituminous coal on the Philadelphia & Reading Railway is approximately 24% greater than that of anthracite. The tare weight in the bituminous coal service is probably also greater, but not in the same proportion as cargo.

To assume the trains in the two services to be of equal length (and, therefore, of unequal weight), would tend to overstate the number of anthracite trains and the expenses chargeable to anthracite traffic. On the other hand, to assume the cargo weights to be equal (and the length of trains, therefore, unequal), would result in an under-statement of the cost of anthracite traffic. Calculations made on each of these assumptions showed that the margin of difference was not very great, and under these circumstances we have thought it reasonable to adopt the average obtained by combining the two methods.

METHODS ADOPTED IN ASSIGNING OR APPORTIONING EACH SUB-ACCOUNT OF EXPENSES AMONG THE SEVERAL CLASSES OF TRAFFIC.

OPERATING EXPENSES ACCOUNTS.

The accounts reflecting the cost of transportation services as a whole are divided into the five general groups of—

I—Maintenance of Way and Structures.
II—Maintenance of Equipment.
III—Traffic Expenses.
IV—Transportation Expenses.
V—General Expenses.

and each general group is subdivided into a number of primary accounts, each indicating the nature of the expenses charged thereto. These accounts are designed, however, to deal with the costs of operating the property as a whole and do not attempt, except partially as between passenger and freight, to show the amounts assignable to the specific classes of traffic served. Neither are the records kept in such a manner as to readily permit the identification of those items that are directly assignable to any one class of traffic included in the Freight Train service, nor is the description given to many of the items that are properly distributable to all classes of traffic sufficiently clear to enable as accurate a division thereof to be made as could be wished.

The methods adopted for apportioning the expenses to the various classes of traffic may be recited in the following order.

MAINTENANCE OF WAY AND STRUCTURES.

The general account Maintenance of Way and Structures, records the expenses incidental to the use of the road rather than those incidental to the transportation over it.

The elements which cause the expenses of maintenance may be divided into the three general groups of—

Wear and Tear,
Decay and Depreciation,
Obsolescence.

Theoretically, the expense incurred by each group should be distributed on the basis which has the closest relation to the cause, but in present time practice, there is not sufficient information available to make the separation accurately, and, moreover, there seems to be no uniformity of opinion among authorities as to the methods of estimating the extent to which each cause is responsible for the maintenance charges. In some cases submitted by Public Utilities Commissions, this division has been attempted, but in the investigation now made we do not believe any valuable end would be attained by attempting such a distinction.

The primary accounts of Maintenance of Way and Structures, showing the expenses on the Division affected, can be arranged according to facilities as under:

Overhead Expenses of Way and Structures,
Track, Roadway and Bridges,
Preventive Facilities,
Signals,
Telegraph and Telephone Lines,
Buildings and Docks,
Joint Facilities,

and may be considered accordingly.

Overhead Expenses of Way and Structures:

The group of accounts referred to as overhead expenses consist of—

Account 1—Superintendence,
Account 19—Injuries to Persons,
Account 20—Stationery and Printing,
Account 21—Other Expenses.

The Pennsylvania Railroad distributed the items common to all the geographical divisions on the basis of gross earnings, but such a method is obviously unsound when the fairness of the rates producing these earnings is the matter at issue. Those items common to all classes of traffic were divided by that company on basis of train miles.

The Philadelphia & Reading Railway distributed that proportion of these accounts common to the system over the various divisions on the basis of "miles of track less sidings," but the relation of the overhead expenses to such a unit is too remote to be acceptable. This company made no separation of these expenses on its books as between the classes of traffic.

The expenses charged to each of the accounts in this group are all in the nature of a burden of the work performed chargeable to Way and Structures, and except where directly assignable to divisions or classes of traffic are fairly distributable in the ratio of all the other accounts in that classification, except those grouped as "Joint Facilities" which already include their proportion of that burden.

Track, Roadway and Bridges:

The following primary accounts have been grouped under the general heading of Track, Roadway and Bridges:

Account 2—Ballast,
Account 3—Ties,
Account 4—Rails,
Account 5—Other Track Material,
Account 6—Roadway and Track,
Account 7—Removal of Snow, Sand and Ice,
Account 8—Tunnels,
Account 9—Bridges, Trestles and Culverts,
Account 18—Roadway Tools and Supplies.

Revenue train mileage has been adopted as the general basis for the distribution of the expenditures on these accounts as between passenger train service and freight train service and no attempt has been made to deal with the elements of wear and tear and decay, depreciation and obsolescence separately. Revenue train mileage (if road expenses alone are being dealt with) or revenue train and switching mileage (if both road and yard expenses are being considered) has, we think, received more general approval than any other basis for the distribution of the element of wear and tear. Objection has sometimes been urged against the adoption of the same basis for the distribution of the elements of decay, depreciation and obsolescence, and clearly these expenditures being less closely related to the services offer greater opportunities for differences of opinion as to their correct distribution.

It should be borne in mind that if the elements are to be dealt with separately, it is first of all necessary to determine what proportion of the total expense is fairly attributable to the different elements, and there is no adequate body of reliable evidence from which to draw correct conclusions on this point. Seeing, therefore, that the alternative methods for distributing the elements of decay, depreciation and obsolescence which have been suggested have, we think, no manifest superiority over that of revenue train mileage we have deemed it preferable to apply this basis to the whole of the expenditures and not to attempt an alternative method which would involve two broad assumptions instead of one.

Other methods for the apportionment of maintenance expenses have been suggested at various times and their applicability to the question at issue remain to be considered briefly.

The car mile basis has been advocated, but a consideration of the differences in train lengths and physical conditions shows clearly that it would charge passenger train service with less than its reasonable proportion. The average length of a passenger train is about five cars, while a freight train has an average of about thirty-five cars; and it is wholly unreasonable to suppose that a freight train should bear nearly seven times as much as a passenger train of the expense of maintaining a track and roadbed. The element of speed has been urged as a reason for assigning a larger portion of maintenance expenses to passenger service, but whilst a passenger express train has greater speed than a slow freight, there is not so marked a difference between a fast freight train and a passenger local. Any method based upon speed overlooks the other elements causing damage, such as the difference in the weight of the cars, both tare and cargo; the better construction of passenger cars over freight cars, the former being built for the comfort of the passengers carried, and the latter for carrying a commodity, the comfort of which need not be considered. The coal car has more droppings, and the dripping of water therefrom may cause as much damage to the track as a fast moving passenger car. There are similar objections to the suggestion that weight should be used as a basis. As between the various services, which are dissimilar in their operation, especially as between passenger and freight, no results from weight could be obtained which would be entirely defensible, and it would tend to burden that service which carried the heaviest tare weight. A passenger car, for instance, includes approximately 90% tare weight and 10% cargo, and the weight of the largest proportion of cargo must be estimated on an arbitrary basis. The anthracite service includes about 33% tare and 67% cargo; bituminous coal about 31% tare and 69% cargo, and merchandise about 60% tare and 40% cargo. Another method called the equivalent ton mile basis was submitted by a committee of the American Railway Engineering Association held last March. This method attempted to equalize the weights, speeds and other conditions causing damage to the track by locomotives and cars. It was not acceptable, however, to the Association, and was referred back to the committee for further consideration as being unconvincing, and, therefore, need only be mentioned here without further comment.

Upon the whole the method of apportionment as between passenger train service and freight train service of maintenance expenditures relative to Track, Roadway and Bridges, which has been most used and which, having regard to the present development of railroad accounts and statistics, rests upon the soundest principles is, we think, that of the revenue train mile in proper combination with the switching mile.

The Pennsylvania Railroad concurrently keeps separate the expenses of maintaining the various yards classified as to passenger or freight, and the expenses of maintaining them are directly assignable as between those services; therefore, in assigning the maintenance expenses now being considered for that company, it is not necessary to include the switching miles. Such switching as is done by the road locomotives is probably of a negligible quantity, and can be assumed to offset the train mileage in the yards.

No such separation has been made on the Philadelphia & Reading Railway except for the Port Richmond yard, and as it was impracticable to determine the switching miles therein performed, the expenses of that yard have been combined with those of the Reading main line. In assigning the expenses of this company, it has been deemed proper to include the switching mileage with the revenue train miles, except for Tunnels (Account 8), through which no switching service is performed.

The Account 18, Roadway Tools and Supplies, is included in this group as there is a close relationship between it and the other accounts. The special tools used for the signal, telegraph and building departments are charged directly to corresponding maintenance accounts, and all other tools, including those which can be used commonly by all maintenance departments, are charged to roadway tools and supplies. As the tools used jointly would not be of any material amount, we have distributed the expenses on the basis of the divided expenses of Accounts 2 to 9, excluding Account 8.

The assignment of expenses as between the different classes of freight train service calls for much the same considerations as arise in determining the proportions applicable to passenger train service and to freight train service. Whilst the various classes of freight train service probably bear a closer relation to each other than obtains between passenger trains and freight trains, there are inherent differences widely distinguishing the various classes of freight trains.

The nature of the differences between the various classes of freight trains has already been discussed in the section dealing with the "Records and Statistical Data employed in the Cost Determinations," (pages 14 to 16), and it is, therefore, unnecessary to make further reference to the subject at this point. A careful consideration of all the differences indicates, however, that the general wear and tear upon the Track, Roadway and Bridges by any one freight train is substantially equal to that produced by any other freight train. In other words, the differences between the classes of trains have a marked tendency to offset each other; slow trains are hauled by heavy locomotives and contain a large number of cars; preference trains are lighter but are operated at a much higher speed; local and mine trains are subject to frequent stops and startings and the local trains, while running, have a relatively high speed.

In view of these facts, and in the absence of more precise information which would be necessary to justify the adoption of another basis, we have concluded that the revenue train mile should be adopted as the unit for the assignment of expenses as between the different classes of freight train service.

The Pennsylvania Railroad had no expenses in this group common to all divisions. The Philadelphia & Reading Railway distributed the expenses of this kind on the basis of "miles of track, less sidings." These expenses had a closer relation to the charges directly assigned to the branches, and the distribution between divisions was adjusted accordingly.

The Pennsylvania Railroad make a distinction in their books as between passenger train service, freight train service and the service common to both classes. This latter class is in turn divided as between passenger train service and freight train service on the basis of the revenue train miles. The method we employed was applied only to the common items.

The Philadelphia & Reading Railway made no distinction, and our distribution has been made of all the items charged to these accounts.

Preventive Facilities:

Accounts 10 to 12 inclusive, Over and Under Grade Crossings; Grade Crossings, Fences, Cattle Guards and Signs; and Snow and Sand Fences and Snow Sheds, may be considered as necessary expenses to safeguard the use of the Track, Roadway and Bridges and keep them clear of obstructions.

Two or three methods of assigning the expenses have sufficient merit to be worth considering.

The first suggestion affects the maintenance of over and under grade crossings, and grade crossings, gates, fences, signs, etc. These facilities are in a large measure originally installed at the instance of law-making bodies for the protection of the public in person and property. The maintenance of these facilities may, therefore, be considered as a tax on the business and as such be distributed on the basis of all expenses. But the serious objection to that basis is that the cost of the transportation over the road forms by far the greater proportion of that total, and to include them would result in ratios obviously unfair to the more expensive services, inasmuch as the services benefit in proportion to the number of units using them, which is the number of trains run. In line with this thought, the suggestion presents itself to use the number of trains, but to obtain the necessary data would be difficult, if not impracticable.

Snow fences are not usually erected by order of the law-making bodies, and the only reason advanced for dividing the expenses of maintaining them on a direct charge basis, is that they are in the nature of an overhead expense. They do exist for the purpose of protecting the use of the road, and, if so considered, should be spread over the expenses reflected in the track and roadway accounts. But the largest proportion of the track and roadway accounts have small relation to the maintenance of snow fences.

It seems preferable, therefore, to adopt the revenue train mileage as the general basis for all the accounts in this group as the means for determining the fair measure of the use of the facilities.

As between the two companies, the conditions affecting the track and roadway accounts in relation to the use of revenue train mile basis, and the revenue train mile plus switching basis, exist in relation to the accounts now under consideration. The former basis in the case of the Pennsylvania Railroad, and the latter basis for the Philadelphia & Reading Railway, have been used for the distribution of this group of expenses, except on the Philadelphia & Reading Railway, those for snow fences have been divided upon the revenue train mile basis inasmuch as the yards are not protected by fences.

The items common to all branches on the Philadelphia & Reading Railway (there are none on Pennsylvania Railroad), had close relation to the direct charges and have been distributed on that basis by us in preference to the basis adopted by the company.

Signals:

The expenses of maintaining signals and interlocking plants (Account 13) should be assigned to the respective services, on a basis measuring the degree of use made of them by each, and the revenue train mile for road signals and switching for yard signals have been adopted as being the best obtainable.

Items common to all branches have been distributed by us on a basis of the direct charges to the branches.

Telegraph and Telephone Lines:

The expenses of maintaining the telegraph and telephone lines are charged to Account 14.

These lines are used jointly to control the train movements while on the road and also for interdepartmental services. As the character of the use of the lines is, therefore, markedly different, it is, we think, fair to assign the maintenance expense as between that proportion to be borne by the Dispatcher's Department and that proportion to be borne by all other departments before apportioning it to the particular traffic services as shown by Account 62, Dispatching Trains, and Account 94, Telegraph and Telephone Operation. The proportion relative to the control of train movements is fairly to be assigned in the ratio of Account 62, Dispatching Trains, to the total of Accounts 62 and 94.

That proportion of maintenance of the telephone and telegraph lines, which is considered applicable to general usage may be regarded as an overhead expense of the entire company, and the ratios of the total expenses provide the basis for its proper distribution.

Buildings and Docks:

The accounts grouped under the heading of Buildings and Docks are—

Account 16—Buildings, Fixtures and Grounds
Account 17—Docks and Wharves

The methods used in apportioning each will be discussed separately.

Buildings, Fixtures and Grounds:

The Pennsylvania Railroad and the Philadelphia & Reading Railway divide the cost of maintaining the buildings, fixtures and grounds into the three classes of passenger, freight and common. The amounts directly assignable to the passenger and freight services, according to the companies' distribution, have been accepted by us, while the assignment of the common group, and the subdivision of the freight group, call for explanation.

The account includes the cost of maintaining all buildings of whatever nature and the fixtures appertaining thereto; repairs and renewals of the necessary machinery and engines to operate the buildings; turntables, cinder pits, etc., repairs to fences, sidewalks and streets adjacent to buildings; landscape gardening, etc., etc.

The account provides for the maintenance of such a variety of facilities that no one relative basis for distribution can be accurately determined, and it was necessary, therefore, to obtain first some basis for a subdivision according to facilities.

The expenses on facilities classified by the Pennsylvania Railroad as common to both passenger train service and freight train service, may be assumed, in the absence of precise data, to be chiefly in connection with section houses, round houses, divisional office buildings, etc. The mutual unit of measure to which the least objection may be taken for the apportionment of these expenses is the revenue train mile.

The expenses then assigned as applicable to freight train service must be divided among the respective groups of freight traffic. A complete analysis of the charges to these accounts, as implied above, is impracticable if not impossible, on account of the manner in which the records have been kept. We were able to obtain a statement showing the cost of maintaining the buildings used exclusively for the merchandise service on one division of the Pennsylvania Railroad, but the results were not sufficiently representative to be of practical value. The separation, therefore, of the expenses apportioned to the freight train service has been accomplished by the use of an arbitrary unit of the train mile, which, while not entirely satisfactory in that it burdens the coal and coke traffic with a portion of expenses (such as maintenance of warehouses), which should really be charged exclusively to the merchandise service, is upon the whole the least objectionable basis yet suggested, when an accurate division is unobtainable.

Fewer details regarding the common items were obtainable from the records of the Philadelphia & Reading Railway than was the case in the Pennsylvania Railroad. Except in special pieces of work, no record is kept, and even then it is not in readily available form. We were able, however, to obtain the description of some work with certain figures as to cost, which enabled us to distribute on closely related bases about 27% of the items classified as common. This total included the maintenance charges of some car shops, engine houses, coal hoists, etc. The remainder has been distributed on the basis of revenue train miles, plus switching. The same bases for the distribution of the amounts assigned to the freight train service were adopted as in the case of the Pennsylvania Railroad, except as to those charges referred to in the above paragraph which were apportioned on suitable relative bases.

Docks:

The expenses of maintaining the docks and wharves (Account 17) of both companies were readily assignable directly to either passenger train or freight services, and the amount chargeable to freight train service, in turn, was divided between coal and merchandise with precision. The coal proportion was then separated between anthracite and bituminous coal on the basis of the respective tonnages handled on the docks.

Maintenance of Joint Tracks, Yards and Other Facilities—Debit Balances and Credit Balances:

Substantially all of the expenses charged to Accounts 22 and 23 on the Pennsylvania Railroad are for the maintenance of facilities used jointly by the various divisions of the company and only a negligible amount has been recovered from or paid to foreign companies. These expenses are in the main for yards and terminals and are susceptible of direct assignment to either the passenger or freight service, the undivided expenses amounting to a small proportion of the total debits and credits.

Whilst we have not examined in detail the charges or credits to these accounts, we have examined the principles on which they are made, all of which appear to be equitable to the interested divisions; the bases mostly used are those of cars, engines or tonnage handled. As they represent proportions of expenses originally chargeable to the various maintenance of way accounts, we have divided them as between passenger and freight service in proportion to the distribution of the total of all other maintenance of way accounts and have followed the same principle in making the further subdivision as between the different classes of freight service.

On the Philadelphia & Reading Railway, the maintenance of tracks, yards and other facilities, the use of which the company shares with others, is to a considerable extent directly assignable. But the mileages on these tracks and yards have been applied in the determination of the ratios used in assigning the expenses of track, roadway and bridges, and other accounts which have been distributed on the same basis as those accounts, namely, train mileages, plus switching. To preserve the equity of the method, therefore, it was necessary to subdivide these accounts on that basis, as the nature of the charges is identical with those of the track and roadway accounts.

MAINTENANCE OF EQUIPMENT.

The general account Maintenance of Equipment comprises twenty-nine accounts, of which eighteen represent the repair and renewal expenses for the locomotives, passenger train cars, freight train cars, plant equipment and floating equipment. Most of these expenses are directly assignable, or at least susceptible of apportionment on closely related data, as between passenger train and freight train services. The remaining accounts, except Nos. 51 and 52, Maintaining Joint Equipment at Terminals, are the overhead expense accounts of the Equipment Department.

In this connection it should be stated that the Philadelphia & Reading Railway Company owns no equipment, but leases all that it operates from the Reading Company. Under the terms of the lease, however, the Railway Company must keep it in good operating condition and renew those units which are retired from service.

Turning now to the expense accounts, we will comment thereon either in groups or individually.

Accounts 25, 26 and 27—Steam Locomotives, Repairs, Renewals and Depreciation:

The expenses of repairing and renewing steam locomotives and providing for the accruing depreciation thereof have been in the main directly assigned to either passenger train or freight train services by both the Pennsylvania Railroad and the Philadelphia & Reading Railway, and except for comparatively minor amounts, we have accepted such assignment.

Exception was taken on the Pennsylvania Railroad to the division made by the company of an additional amount set aside for depreciation, covering the locomotives both in passenger train service and freight train service. That division was made by assigning lump sums to each service, but as depreciation closely resembles in nature

the repair expenses, we have distributed it in the ratio of those accounts.

The exception taken to the distribution of the expense accounts on the Philadelphia & Reading Railway was in respect to the locomotives engaged in work train service, of which the company made no division. As is shown in a succeeding paragraph, the expense of maintaining work equipment should be considered in the light of a burden on the service in which it is engaged; that is, chiefly for maintenance of way and structures and for service in the clearing of wrecks, and we have divided the expense in the ratio of the sum of expenses charged to that general account and of Account 93, Clearing Wrecks.

The distribution over the various divisions of the respective roads, being based on the mileage of locomotives, was substantially acceptable for the purpose of this examination. We did change the mileages of the Philadelphia & Reading Railway for the purpose of continuing the uniformity of methods, as follows:

> Passenger Train Locomotives—Whereas the company included 25% of the mixed locomotives mileage, we have used 50% so as to coincide with the methods adhered to in the calculation of revenue train miles.
>
> Freight Train Locomotives—The company included 75% of the mixed locomotives; we used 50%, for the reason given under passenger train locomotives.

The Philadelphia & Reading Railway does not provide for any accruing depreciation, and, judging from the published accounts, no such provision seems to be made by the holding company. However, comparing the expenditures for maintaining the Reading equipment as disclosed in the annual reports during the five years ending June 30, 1912, and including the period chosen for this examination, the expenditures made are fair in comparison to those made by other anthracite roads when the depreciation provision made by them is included, and for that reason we have not considered it necessary to make additional charges to maintenance accounts.

Having now arrived at the division of the maintenance expenses of steam locomotives between passenger train service and freight train service; the subdivision of the proportion so charged to the latter requires further examination.

The causes entering into the maintenance of locomotives may be arranged into the general group as follows:

Caused by—
Fuel consumption,
Speed of engine,
Weight of engine,
Weight of train,
Length of train,
Track and roadway conditions,
Atmospheric conditions.

The same difficulties exist in determining the degree of expense caused by each group as in segregation of causes relating to track, roadway and bridges, and it therefore seems better to disregard the causes and treat the repairs as to a whole engine, and to adopt some one related ratio to measure the entire unit.

Several proposals have been suggested, among which was the cost of operating the locomotives. This proposal was rejected as it is preferable to adopt some basis, the controlling factor of which would have a closer relation than the wages paid to the enginemen and firemen, which is a dominant factor in such operations, while it is likely that coal consumption contributes to a very large degree to the causes of the repairs. The tonnage hauled does not appeal to us as a basis, for the reason advanced under the caption of Track, Roadway and Bridges, that the train having the heaviest tare weight would be unduly burdened.

One other suggestion seems worthy of serious consideration, viz., the draw bar pull of the locomotives, and this must be considered in conjunction with the prevailing direction of the traffic as regards grades. There are many physical facts, however, which would have a direct bearing on this method, information as to but few of which is yet available, and, therefore, it must be abandoned as impracticable of application.

The method which has received the greatest support from railroads not having specific types of engines for the passenger and freight train services, has been the basis of the locomotive mileage, and after careful consideration of all the facts and available data, that basis appears to be the best yet presented for the further distribution of the freight train locomotive maintenance. Comparisons show that the engine repairs remain most constant when put on a train mile basis, and as that statistical unit constitutes a measure for all the causes, it has been concluded the locomotive miles may be taken as in the same ratio in the absence of more accurate data. It has been assumed also that, taking all matters into consideration, each freight train has about the same amount of switching and, therefore, the repairs to the switch engines may be taken in the same ratio as the train miles.

Accounts 31, 32 and 33—Passenger Train Cars—Repairs, Renewals and Depreciation:

The repairs and renewals on passenger train cars for both companies have been charged directly to passenger train service, as has also the provision for depreciation made by the Pennsylvania Railroad. The same comments as under steam locomotives regarding depreciation apply to this class of equipment operated by the Philadelphia & Reading Railway.

Accounts 34, 35 and 36—Freight Train Cars—Repairs, Renewals and Depreciation:

The repairs and renewals of freight train cars have been charged by both companies to freight train service direct, and the depreciation provided by the Pennsylvania Railroad has also been directly assigned thereto.

The records maintained by both companies do not disclose the kind of freight car repaired making the direct assignment of the freight train car repairs between the respective freight groups impossible, and it was necessary to resort to the use of an arbitrary unit. The ton car mile naturally suggests itself as a fair basis to apportion these expenses, but there is no conclusive evidence to show that weights have any material effect on the repairs made necessary. It is more apparent that the handling does a great harm, particularly to the body of the car, but there again the construction of the car is such as to withstand the ordinary carelessness. Thus, while a coal car is loaded and unloaded by dropping the coal in and out, the car (especially the steel hopper type) is built to withstand that rough handling, but a box car, for instance, is not so substantial and will have its doors broken by slamming. Except on a down grade line, where the weight of a car might have a tendency to pull the car after the brakes have been set, there is not much difference in "flat wheels," which generally is a very big percentage of the expense, between the kinds of cars.

Aside from the handling, the wear and tear on cars while remaining unmoved is probably equal, except that metal cars withstand the atmospheric changes better than do the wooden ones. Consideration of all facts leads to the conclusion that most of the damages are caused during the time a car is in motion, and from that point of view the car mileage presents the least objectionable measure to apply the expenditures against the classes of freight traffic.

A separation of the freight train car renewals on the Philadelphia & Reading Railway has been made by direct assignment as between coal cars and merchandise cars. The proportion so applied against the combined coal service was separated by us on the basis of the respective car miles, and to the branches in a like manner.

A suggestion was presented to distribute the renewals on a ton mile basis, in view of the specific separation between services, and at first thought it seems fair to adopt the functional basis. But consideration must be given to the important facts, first, that the tonnage is carried in foreign cars as well as in the home cars, whereas the renewals are substantially all for home cars; secondly, that the loading and unloading of the cars probably does much damage to coal cars and, therefore, the average length of the haul would need to be equalized as well as the difference in the average cargo per car. All of these factors would tend to subject the bituminous coal to a much larger proportion than seems reasonable, because a bituminous coal car on the average carries more cargo than an anthracite car, particularly on the Philadelphia & Reading Railway. Also, as no bituminous coal originates on the lines of the Philadelphia & Reading, which is primarily an anthracite road, it is fair to assume that most of the bituminous coal is carried in foreign cars, whilst most of the anthracite is in Reading cars. The differences in the number of cars run belonging to foreign lines and to the home road are, however, equalized through the Hire of Equipment, as the increase in that account should make a decrease in the renewal account when the former is taken over a sufficiently long period of time to ensure that all the per diem rates would have been used.

To correctly compensate the differences in cars used it is, therefore, necessary to accept some method which is commonly related, and that seems to be found in the car mile basis. It is further advisable as being accepted and used by railways generally in the compilation of statistical data.

Accounts 40, 41 and 42—Floating Equipment—Repairs, Renewals and Depreciation:

These charges appear only on the Pennsylvania Railroad records, and during the year amounted to $17,015.27, all of which was assigned by the company to the freight service, as these facilities are used for the repairs of docks and wharves in the terminals, and we have divided the expenses on the basis of the divided expenditures for docks and wharves.

Accounts 43, 44 and 45—Work Equipment—Repairs, Renewals and Depreciation:

The Pennsylvania Railroad divided the expenses of maintaining the work equipment on the train mile basis, but the Philadelphia & Reading Railway attempted no such division.

These facilities are used in connection with the maintenance of the property and for clearing wrecks, the expenses of which were divided on various bases. We have considered the divided expenses for maintenance of way and structures, and clearing wrecks, as most closely measuring the ratio assignable to each service.

The freight train service expenses have been assigned to the commodities on a basis of the divided expenses of maintenance of way and structures and clearing wrecks.

Accounts 24, 46, 48, 49 and 50—Superintendence, Shop Machinery and Tools, Injuries to Persons, Stationery and Printing, and Other Expenses:

As all of the above expenses are overhead in respect of having been equally caused by all of the equipment repair accounts, we have subdivided the amount between passenger and freight on the basis of the equipment repair accounts.

These expenses are also overhead expenses for the freight service and have been assigned to the commodities in the ratio that the divided expenses of each of the commodities under the repair accounts bear to the total expenses.

The Philadelphia & Reading Railway spread these expenses over the various divisions in the ratio of one-half on the basis of the locomotive mileages and one-half upon that of the car mileages.

TRAFFIC EXPENSES.

The traffic expenses represent outlays made for the purpose of securing business, and may be assigned to all services directly or on some very closely related bases. Both the Pennsylvania Railroad and the Philadelphia & Reading Railway make a separation as between passenger train and freight train services, which has been accepted by us, except for a few minor changes which will be explained in our comments on each account.

We did not accept the distributions between divisions and branches as made by the companies upon gross earnings by the Pennsylvania Railroad and the revenue train mileages by the Philadelphia & Reading Railway, as those bases were not obtained from statistical data as closely related as could be obtained, or which were as sound in theory as is desirable.

As already stated, this account is intended to reflect the cost of attracting business, and the business obtained and the distance hauled as measured by (a) the passengers' one-mile for passenger train service, and (b) the respective ton miles for each class of freight train service, present units by which a fair measure may be made of the benefits accruing to each.

The methods used by the companies of pooling all the expenses for use by the road as a whole were adhered to by us, as while not being entirely sound in theory it is reasonable in practice, although the activities of local agents may have (especially in passenger service), a marked effect on the results of the local division or branch. Yet to what extent the results are so confined could be arrived at probably only by mere estimates without current data to substantiate them.

Account 53—Superintendence:

The Philadelphia & Reading Railway charged a part of the general manager's salary to traffic expenses, and assigned the whole thereof to freight train service. On investigation it was learned that he did not spend his time exclusively in connection with that service, and that a proportion should be assigned to passenger train service. This division was made by us in the ratio of all the other charges to traffic expenses. Another item of expense, the distribution of which as made by the company was not on as closely related basis as was obtainable, consisted of a proportion of the cost of the repairs to the general office building chargeable to these expenses, which was assigned on the arbitrary two-fifths and three-fifths basis. It seems preferable to view this item in the light of an overhead expense, and to distribute it on the basis of the salaries paid to the officers and clerks occupying quarters in the building. This basis gave 31.71% to passenger and 68.29% to freight.

The proportion assigned to the freight service was capable of quite close identification between the respective commodities. The degree to which the charges may be assigned directly can be judged from the departmental expenses charged to this account as follows:

Coal Agents' Departments.
General Freight Agents' Department.
Miscellaneous Items chargeable to Merchandise.
Common to all Merchandise Service.

The items affecting the coal agents' department were assigned by us between anthracite and bituminous coal on the basis of the respective ton miles. This method is not altogether free from criticism, as it tends to overstate, if anything, the charges to anthracite, as that service (especially in the case of the Philadelphia & Reading Railway), takes care of itself in a large measure, and does not require the efforts of the coal agent to attract the tonnage hauled, while on the contrary the competition for the bituminous coal does require constant attention. On the other hand, the Philadelphia & Reading Railway have to attend to the compilation of anthracite tariffs and not to bituminous coal tariffs. In the absence of more specific data, however, the ton mile basis provides a reasonable method of distribution.

The expenses of the general freight agent, and the other items affecting the merchandise traffic, have been directly assigned to it.

The items common to all freight traffic and not assignable directly to any one class can be considered fairly as an overhead expense of the Traffic Department. On that theory they have been spread over the various services on the ratios of the other expenses.

Account 54—Outside Agents:

The expenses of the outside agents have been directly assigned to the classes of traffic which are affected thereby. Expenses of the Union Line and Empire Line were distributed to divisions by the Pennsylvania on the basis of gross earnings from these lines. The car miles or ton miles of this class of business are not reported separately, and as the whole expense applies to the merchandise freight service, we have accepted the company's distribution.

Account 55—Advertising:

The expenses for advertising are incurred in connection with either the passenger train service or freight, and have been directly assigned thereto. The freight proportions have been divided on the basis of an overhead expense.

Account 56—Traffic Associations:

The companies report the expenses of traffic associations as to both passenger train service and freight train service, and the only proportion of freight expenses chargeable to coal service is in connection with the Tidewater Bituminous Steam Coal Traffic Association, which is chargeable directly to the bituminous coal service.

Account 57—Fast Freight Lines:

The expenses of the fast freight lines are all chargeable directly to merchandise service.

Account 58—Industrial Immigration Bureau:

The expenses charged to the above account were assigned by the Pennsylvania Railroad between passenger and freight on an actual basis, and distributed to divisions on the basis of gross passenger earnings for the passenger expenses and merchandise earnings for freight, expenses which we re-assigned to divisions on the basis of the passengers carried one mile for the passenger expenses and the tons carried one mile of merchandise freight for the freight expenses. The company consider that the freight expenses are for the purpose of increasing the merchandise traffic in accordance with which we have assigned the expenses to merchandise.

The Philadelphia & Reading Railway has no expenses chargeable to this account.

Account 59—Stationery and Printing:

The charges to Stationery and Printing Account assigned to freight service consist chiefly of tariffs, and while the proportion of the expense for the other stationery and printing items was obtainable, the amount involved would be so small as to not justify the labor to determine it, especially when it is considered that it would in turn have to be distributed on an arbitrary basis over the respective commodities resulting in proportions which would be probably negligible.

In the case of the Pennsylvania Railroad the freight expenses consist principally in the cost of tariffs, and the basis for apportionment to the commodities would appear to be the volume of traffic, but as the coal traffic is shipped in car load lots without continuous changing of rates, we have considered that the divided expenses of the Traffic Department would be the best measure of the portion of the expenses applicable to the commodities.

No bituminous coal tariffs are printed and circulated on the Philadelphia & Reading Railway, and the expense of these tariffs was, therefore, divisible only between the anthracite and merchandise services. A precise division was possible, although it is questionable whether the results would be justified by the labor expended, and it was considered that a separation based on ton miles would give reasonable results when viewing the traffic expenses as a whole, although probably overcharging the anthracite service to some degree as regards the specific item distributed.

We made a minor change as between the charges to passenger and freight as reported by the Philadelphia & Reading Railway, as the proportion of the wages of the Stationers' Department assigned to traffic expenses had been divided in a most arbitrary manner; thus the wages paid to the clerks had been charged to freight, and the salary of the stationer to passenger traffic. This distribution may be better made in ratio to the charges originating from the Stationers' Department.

Account 60—Other Expenses:

The expenses were distributed by the company between passenger and freight. As the amounts are small no analyses of the accounts were made by ourselves. The freight expenses, which are likewise in the nature of an overhead burden, are applicable to the commodities on the basis of the other assigned expenses.

TRANSPORTATION EXPENSES.

The expenses entering into this general account, Transportation Expenses, are susceptible of assignment to the passenger train or freight train service, either directly or on the basis of directly related data.

Both companies have assigned a substantial part of the expenses directly to each service and on the Pennsylvania Railroad common expenses were apportioned on various bases which in some cases we have accepted, though in others we have felt unable, for reasons stated hereinafter, to do so.

The freight expenses whilst assignable directly to classes of traffic, in some cases, are subject to apportionment on the basis of closely relating data. It is to be noted, however, that neither company compiles concurrently the information required for this subdivision and it has, therefore, been necessary to compile it either in full or in sufficient detail to provide an adequate test applicable to the period as a whole.

Turning now to the primary accounts in this group, the considerations relating to each will be referred to briefly.

Account 61—Superintendence:

The Pennsylvania Railroad assigned certain of the expenses of superintendence directly to the freight and passenger services, and the items common to both services on the basis of revenue train miles, but the Philadelphia & Reading Railway made no separation thereof. It is to be noted, however, that while the Philadelphia & Reading Railway made no assignment, certain of the expenses, particularly of the Car Service Department, are almost entirely applicable to the freight train service, and we have made adjustments accordingly.

The common expenses for superintendence of both roads are fairly subject to subdivision on the basis of the direct charges under the transportation group. The expenses assignable to the freight train service should be distributed to each of the commodities in the ratio of the divided expenses of all the primary accounts, excepting Accounts 77 and 78, Operating Joint Yards and Terminals—Debit and Credit, and Accounts 104 and 105, Operating Joint Tracks—Debit and Credit, to the total, these expenditures for joint facilities having their proportion of superintendence.

Account 62—Dispatching Trains:

The expenses chargeable to the above account are in the main common to both services and assignable on the basis of closely related data. The Pennsylvania Railroad apportioned these expenses in the ratio of revenue train miles, but no distribution has been made by the Philadelphia & Reading Railway. Each class of train while on the road is subject to the train dispatcher's orders and the train dispatcher's service is assignable on the basis of the hours of each class of trains on the road. The speed of passenger trains as a class is considerably greater than that of the freight train as a class; therefore it would appear that the train mile basis of assignment adopted by the Pennsylvania Railroad overloads the passenger train service and that the train hour basis is more nearly equitable. Train hour statistics, however, are not compiled concurrently by either company, but in the case of the Pennsylvania Railroad, the passenger train hours for an average month was compiled from the company's train schedule. Whilst the test does not reflect the additional time on the road caused by delayed trains, the total thereof would form only a negligible number of hours and would not materially affect the result. The freight train hours were compiled by the company for our use from conductors' reports and train master's sheets for the month of June and December for Belvidere Division, and June and January for all other Divisions, and the average of these months used for the assignment of the freight proportion; while on the Philadelphia & Reading Railway a test was made by us from the train dispatcher's sheets for the two days of October 15-16, 1913.

The freight expenses were apportioned to commodities on the Philadelphia & Reading Railway on the basis of constructive train miles as previously described on page 18.

The expenses on the Pennsylvania Railroad were distributed to the various classes of trains on the basis of the train hours of each class, and the proportion so assigned to slow tonnage trains on the Pennsylvania Railroad distributed over the various commodities hauled therein on the basis of car mileage. We were, however, unable to obtain the train hours of light locomotives and locomotives with cabooses. The hours of these locomotives on divisions other than Philadelphia, Schuylkill and Shamokin would be chargeable to the various classes of trains in proportion to their mileage; on the Philadelphia Division they would be chargeable to the slow train service. Inasmuch, however, as considerable labor would be involved in ascertaining these hours and the result would not be materially affected thereby, we did not compile the figures. On the Shamokin and Schuylkill Divisions they could best be assigned by an estimate of the division officials.

Account 63—Station Employees:

The Pennsylvania Railroad has distributed the wages of employees to the passenger train and freight train services either directly at exclusive stations, or at stations where the duties of the employees are common to both services on the basis of an estimate of the time employed. This would appear to be a fair subdivision and we have accepted it.

The Philadelphia & Reading Railway has distributed between passenger and freight train services, the wages of employees at exclusive stations to their respective services, whilst the wages of employees who are engaged on work common to both passenger and freight train services, mostly at small stations, were not assigned to either.

The Philadelphia & Reading Railway does not prepare any accounts or statistics of the cost of employees engaged in common service, and to do this work as a part of this investigation would have entailed an amount of labor unwarranted by the results, especially in view of the liability to error arising from estimates made by station agents and other employees which could be accepted only after most careful scrutiny. In this case, it seemed preferable to adopt a method which, while arbitrary, would not unduly burden either service, and for this purpose we have adopted the proportions for common employees that were found for exclusive service employees.

Inasmuch as this inquiry has to do solely with the cost of the anthracite service from the mines to Philadelphia, only the station employees at the scales and at the Philadelphia Terminal have been included in our calculations on the Pennsylvania Railroad.

On the Pennsylvania Railroad the weighing and way billing of anthracite is performed at the scales and the wages of employees are assignable to that commodity. At other stations on coal producing divisions and on divisions incidental to the coal haul to Philadelphia, the wages of station employees were assigned to merchandise commodities as Philadelphia coal receives its Terminal expenses from the Philadelphia Terminal. At the Philadelphia Terminal some of the wages are directly assignable. At Mantua Transfer, where only merchandise is handled, the wages can be assigned to this service, while the wages of the office force at Greenwich Pier, where only coal is handled, can be assigned to coal and distributed to the coal commodities on the basis of the tonnage at this station.

At the other stations in the Terminal where all commodities are handled, the wages were classified in accordance with services performed at the office, warehouse, team tracks and by all other outside forces. The employees at warehouses and team tracks are engaged on merchandise commodities, and their wages can be assigned accordingly. The employees at the office and all other outside forces are engaged on all classes of commodities. To determine the proportion applicable to each it may be fairly held that a freight bill represents the unit of inward business and a shipping order the outward business, and that no greater clerical labor is required in recording a unit of outward than inward business.

As there must be a freight bill for each car of coal, the proportion of the common wages applicable to coal would be the ratio that the number of cars of each class of coal received in the Terminal bears to the total freight bills and shipping orders which is the basis we adopted.

In the case of the Philadelphia & Reading Railway the wages of employees at the scales were assigned to anthracite on the basis of a test made of the pay-roll for the month of August, 1912, while the wages of employees at Port Richmond were assigned to coal on the basis of the tonnage of each commodity. At all other stations the wages of exclusive warehousemen and team track forces were assigned to merchandise, and the wages for office forces and general work apportioned to the commodities in the ratio that the number of coal cars of each class of coal received bears to the total freight bills and shipping orders. This apportionment was made on the basis of a test made on the Pennsylvania Railroad, as we were informed this data had not been compiled on the Philadelphia & Reading Railway. Whilst the proportion of the coal deliveries to freight bills and shipping orders will not be the same on both roads, the proportion applicable to anthracite is so small that in any event there would be no material difference.

Account 64—Weighing and Car Service Associations:

These expenses on both roads represent each company's proportion of the cost of Associations for the examination of scales at warehouses and the inspection of package freight as a check on the proper classification by the shipper. As this whole charge is in connection with merchandise traffic, the expenses have been assigned accordingly.

Account 65—Coal and Ore Docks:

The expenses on the Pennsylvania Railroad represent the cost of maintaining docks at Greenwich Pier which are used exclusively for coal and coke, and we have assigned them on the basis of the tonnage handled.

The expenses on the Philadelphia & Reading Railway can be fairly subdivided between coal and merchandise docks. The expenses of the coal docks we have distributed to the coal commodities on the basis of the tonnage handled.

Account 66—Station Supplies and Expenses:

The expenses were assigned by both companies either directly to the passenger or freight services or as common to both services.

The Pennsylvania Railroad had assigned the common expenses to each service on the basis of revenue train miles. It would seem, however, that the expenses are more closely related to the wages of station employees, and the direct assignment of these expenses could be held to fairly apportion the expenses to each service.

On the Philadelphia & Reading Railway the common expenses were apportioned to each service on the basis of the directly assigned expenses.

The freight expenses are not susceptible of direct assignment to commodities, but were apportioned on both railroads to the commodities in accordance with the divided commodity expenses of wages of station employees.

Accounts 67 to 76—Yard Expenses:

The accounts grouped under the general heading, Yard Expenses, are:

No. 67—Yard Masters and their Clerks.
68—Yard Conductors and Brakemen.
69—Yard Switch and Signal Tenders.
70—Yard Supplies and Expenses.
71—Yard Enginemen.
72—Enginehouse Expenses—Yard.
73—Fuel for Yard Locomotives.
74—Water for Yard Locomotives.
75—Lubricants for Yard Locomotives.
76—Other Supplies for Yard Locomotives.

The expenses with the exception of Accounts 67, 69 and 70, and negligible amounts for coal and water were assigned by both companies directly to their respective services. On the Pennsylvania Railroad, we have assigned the common expenses on the basis of the switching miles, whilst on the Philadelphia & Reading Railway the assignment was made on the basis of the directly assigned expenses.

We were unable to secure any data of the particular commodities handled in all the classification and station yards for the subdivision of the freight expenses, but all through cars have their proportion of shifting in the classification yards at terminals of each division (with the exception of through freight trains passing from one division to another, which is only a small proportion of the total), and the local shipments have their proportion of switching in the origin and destination station yards. It would, therefore, appear that the number of loaded cars of each commodity (determined on the basis of the number of tons of each commodity handled on the respective divisions apportioned on the average load per car of each commodity), plus the empty cars (determined upon the basis of the percentage of the empty car mileage to the loaded car mileage), would fairly represent each commodity handled on a division.

At station yards a coal car would require the same switching miles as a merchandise car and whilst substantially all the merchandise cars are shifted to the warehouse for loading and unloading and pulled when the warehouse operation is completed, the coal cars are shifted to industrial sidings, or sidings of local coal merchants, and collected when the contents have been removed. In both operations practically the same time is consumed, excepting in some in stances owing to the heavy merchandise traffic, a shifting engine would work more merchandise cars than that of coal or coke. However, it may be considered that approximately the same operation is required for merchandise cars as for coal cars, and, therefore, for the apportionment of the expenses of both companies, we have used the ratio that the cars of one commodity bears to the total cars of all commodities of a division. The basis of gross tonnage was not adopted because the density of traffic in the various yards usually requires the yard master to dispose of the cars as soon as they are loaded without waiting for the engine's maximum capacity before commencing operations. Consequently, the load of cars does not, to any great extent, affect the number of cars handled.

The consumption of fuel and water is influenced to some extent by the load of the switching movement, and it may be contended that coal commodities should receive a greater proportion of these expenses than would be apportioned on the basis of cars handled; but a substantial part of the fuel and water and other supplies used by yard locomotives is consumed during inactive periods of the locomotive, or while shunting cars about the yard, when the consumption is not gauged by the number of cars in the train, but rather by the activity of the locomotive. The coal and other supplies, to a substantial degree, are consumed in maintaining a standard steam pressure which may or may not be necessary at all times during the switching hours of the locomotive. Consequently, the effect on cost of heavier loads is believed to be relatively so small as to be negligible.

Accounts 77 and 78—Operating Joint Yards and Terminals—Debit and Credit:

The expenses charged and credited to the two accounts, Operating Joint Yards and Terminals, Debit, and Operating Joint Yards and Terminals, Credit, respectively, are on the whole assignable directly as between passenger and freight services, and are so divided by the two railroad companies. In the case of the Philadelphia & Reading Railway, the distribution was found to be unreliable, owing to clerical errors both as to services and branches. A redistribution was, therefore, made. The direct division of the credit accounts is unnecessary, as the credits have a more direct relation to the charges to all the other yard expenses than to the service maintained by foreign roads or unaffected divisions.

The freight expenses for both companies are affected by the same general conditions applying to all the yard expenses and are apportionable to the commodities in the ratio of the divided yard expenses.

Accounts 80 to 85—Road Haul Expenses:

The following accounts may be considered together:

No. 80—Road Enginemen.
81—Engine House Expenses—Road.
82—Fuel for Road Locomotives.
83—Water for Road Locomotives.
84—Lubricants for Road Locomotives.
85—Other Supplies for Road Locomotives.

The Pennsylvania Railroad assigned all the expenses directly to the passenger train or freight train service, with the exception of a portion of the expenses for Engine House Expenses, Fuel for Road Locomotives and Water for Road Locomotives (Accounts 81, 82 and 83), which were apportioned on the basis of revenue train miles.

The Engine House Expenses—Road, common to the two classes of service, may fairly be held to be measured by the road locomotive miles just as the corresponding expenses for "Engine House Expenses—Yard" were measured by the yard switching miles.

The common expenses for fuel which amounted to only a small proportion of the total were apportioned to the two classes of service on the basis of the directly assigned expenses.

The water for locomotives can be said to be consumed in proportion to the coal and the expenses were assigned accordingly.

The Philadelphia & Reading Railway assigned directly all the expenses to passenger or freight train services.

The proportion of the Road Haul Expenses assigned to freight train services was subdivided to commodities on the basis of closely related data. The necessary statistics are not compiled concurrently by either company nor is the same information available in both cases so that to some extent the expenses cannot be apportioned uniformly.

The wages of engineers and firemen, comprising road enginemen, are assignable to the various classes of trains in accordance with the schedule rates per run of through trains or local trains, the through trains consisting of the preference trains and slow tonnage trains.

For the division of the fuel expenses several bases may be considered. The gross ton miles which include the weight of the car might be taken as a fair measure of the fuel consumption while the locomotive is in motion, but a substantial proportion of the fuel is consumed by engines in round houses, yards and terminals, and while running light to balance traffic. This method would, therefore, have a tendency to overstate the cost of coal or heavy traffic. The car miles are open to the same objections as the gross ton miles, though perhaps in a lesser degree. The revenue train miles are, we believe, the best measure of the fuel consumed in the transportation of each commodity. Tests sufficient to indicate average traffic conditions on the Pennsylvania Railroad show that preference trains approximate twice the speed of slow tonnage trains, but the latter class of trains haul nearly twice as many cars, so that it may be safely concluded that one slow tonnage train mile consumes not more coal than one preference train mile. The local trains maintain a speed between stations nearly as great as the preference trains, but haul only approximately one-half the number of cars. However, this is offset by the continuous starting and stopping and waiting time of local trains at stations. The mine trains average less miles per hour than the slow tonnage trains and also less cars per train, but the lesser distance of the trip of a mine train creates more stopping and starting which tends to offset the greater speed of slow tonnage trains and their larger number of cars. It should also be considered that mine trains have help which reduces the fuel consumption per mile by reason of the maximum pull not being required during the whole trip.

The expenses of Water, Lubricants and Other Supplies for Road Locomotives can be held to be fairly proportional to the fuel consumed which basis we have used in the apportionment of the expenses to commodities.

The train operation on the Philadelphia & Reading Railway presents different conditions for the subdivision of Road Locomotive Expenses. The distinctive train service for the transportation of merchandise or mineral freight does not prevail so markedly as on the Pennsylvania Railroad.

It would appear, however, that where there is no commodity distinction in the train service, the constructive train mileage is closely related to the expenses and best measures the proportion of the charges applicable to each commodity, and this is the basis we have applied in our apportionment.

Accounts 88 and 89—Road Trainmen and Train Supplies and Expenses:

The expenses were assigned directly by both companies to either the passenger or freight train service, and as we have no reason to doubt the general accuracy of the distribution the companies' assignment was accepted.

The average rates of wages per train mile in the case of the Pennsylvania Railroad are readily determinable by the same methods as were applied in the case of enginemen. Allowance has, however, to be made for the variations in the number of employees per train resulting from the operation of the full crew laws in the States of Pennsylvania and New Jersey, which stipulate a minimum of two trainmen for trains of less than thirty cars and three for thirty

cars or more, and also for the variations in the number of employees engaged in the spotting of cars at the mines.

Tests for the months of June and January showed that the length of the preference trains is usually less than thirty cars, whilst that of the slow tonnage train is frequently sufficient to incur the cost of additional trainmen. During certain periods preference trains are composed of more than thirty cars and operated at the higher cost per mile, but as the percentage of such trains was not available, but was known to be small, we ignored this factor. Local trains are invariably operated with less than thirty cars. The number of trainmen on mine trains varies according to operating conditions, but we calculated the average number of employees by tests of the wages of trainmen for one month. Applying the rates per mile to the average number of employees ascertained for the different services and distributing the balance of the expenditures on this account in proportion to the amounts so assigned, we were able to arrive at an apportionment of the entire expenditures which we believe is substantially correct.

In the case of the Philadelphia & Reading Railway the information necessary for the subdivision of expenses on the same basis as was used in the case of the Pennsylvania Railroad was not available and, therefore, the ratio of constructive train mileage was adopted. Calculations showed that the application of the same basis in the case of the Pennsylvania Railroad would have produced results not differing materially from those obtained by the method already described.

Account 90—Interlockers, Block and Other Signal Operations:

The expenses at terminals were assigned by the Pennsylvania Railroad directly to each class of traffic, while on the Philadelphia & Reading Railway no direct assignment was made. The common expenses on the Pensylvania Railroad may, we think, be apportioned between the passenger and freight services on the basis of revenue train miles, while on the Philadelphia & Reading Railway the switching miles should be included to reflect the terminal expenses.

The expenses of the freight service are assignable in each of the companies to the commodities on the same bases as used for the division of train supplies and expenses.

Account 91—Crossing Flagmen and Gatemen:

The expenses of each company are susceptible of subdivision between the passenger and freight services, and the freight expenses to commodities on the same bases as are described for Interlockers, Block and Other Signal Operations.

Account 93—Clearing Wrecks:

Nearly the whole of the expenses were assigned by the Pennsylvania Railroad to either the passenger or freight train services, and the remaining common items apportioned on the bases of revenue train miles. These expenses were assigned directly by the Philadelphia & Reading Railway as between passenger train service and freight train service, and this assignment was accepted by us. The freight expenses of both companies can be held to be apportionable to commodities on the basis of train miles.

Account 94—Telegraph and Telephone Operations:

The expenses on both companies, except for minor assignments by the Pennsylvania Railroad to each class of service, are common items. The services are used in connection with Maintenance, Operation, Traffic, and Administration, and the expenses are, therefore, to be considered as a general overhead and apportioned to the passenger and freight services in their respective ratios of the total expenses and to commodities in the approximate ratio of the total freight expenses.

Accounts 97 and 98—Printing and Stationery, and Other Expenses:

A small proportion of the expenses were assigned directly by the Pennsylvania Railroad to each class of traffic and the common expenses apportionable on the basis of revenue train miles. No apportionment was made by the Philadelphia & Reading Railway.

As the expenses relate to the whole transportation service, we have apportioned the common charges in each case both as between passenger and freight services, and as between commodities, on the bases of the total transportation expenses, excepting Joint Facility Accounts (77 and 78 and 104 and 105) which bear their proportionate part of the cost.

Accounts 99 and 100—Loss and Damage, Freight and Baggage:

The expenses of both companies are directly assignable to the freight and passenger services, respectively, and the freight proportion is in turn directly assignable between the respective commodities.

Accounts 101, 102 and 103—Damage to Property and Damage to Stock on Right of Way, and Injuries to Persons:

The expenses on the Pennsylvania Railroad were to some extent directly assigned to each class of service. The expenses common to both services were apportioned on the basis of revenue train miles. On the Philadelphia & Reading Railway all expenses were assigned by the company to the passenger or freight service. As these expenses of both companies appear to be an overhead expense of the whole transportation service, we have apportioned the charges between the passenger and freight train services and the freight expenses to commodities on the basis of the assignment of Accounts 97 and 98.

Accounts 104 and 105—Operating Joint Tracks and Facilities—Debit and Credit:

The expenses of the Pennsylvania Railroad were nearly all assigned directly between the passenger and freight services, and the remaining expenses apportioned on the basis of revenue train miles. The Philadelphia & Reading Railway directly assigned a substantial part of their expenses between passenger and freight services, which we have restated, owing to the company's incorrect distribution.

The common expenses credit of both companies can be held to be fairly subject to subdivision between the passenger and freight train services in proportion to the total transportation expenses excepting yard expenses to which these expenses do not apply, and the freight expenses apportioned to commodities in the ratio of the total transportation freight charges, excepting the freight expenses of yards.

GENERAL EXPENSES.

The expenses in this group, for both companies, may be treated as overhead charges against the system as a whole, and should, therefore, be apportioned to the divisions under examination on the basis of some closely relating data.

The Pennsylvania Railroad subdivided the entire group of general expenses to divisions of the system, (a) as to expenses common to both passenger and freight services upon the basis of the total gross earnings, and (b) as to expenses assignable to a given service upon the basis of the relative proportion of the gross earnings of that commodity. The expenses common to both passenger and freight services were in turn apportioned to commodities on the basis of revenue train miles. The method of apportionment of the expenses adopted by us will be dealt with under the respective primary accounts.

The Philadelphia & Reading Railway made no distribution of these expenses either over the divisions and branches, or as between the various kinds of traffic. We were able to assign a substantial part of the general expenses to either the passenger train service or the freight train service, and to commodities, but no practical use could be made of the assignment inasmuch as we were unable to apportion these expenses to the individual divisions or branches. We have, therefore, apportioned all the expenses as a group to the divisions and to the various classes of traffic on the basis of the charges to all the other operating accounts.

As the foregoing fully indicates the treatment given to the general expenses of the Philadelphia & Reading Railway, the Pennsylvania Railroad expenses only will be considered in re the following comments on primary accounts.

Accounts 106, 107 and 108—Salaries and Expenses of General Officers, Clerks and Attendants, and General Office supplies and Expenses:

The expenses of the system are assignable to exclusive passenger, freight, or the common service of all traffic. The passenger expenses comprise chiefly the department of the auditor of passenger traffic. The company apportioned the expenses to divisions on the basis of the passenger earnings to which basis our objections have already been expressed. The unit that is more closely related to the services of the department would appear to be the passenger carried one mile, which we have used in our apportionment.

As these expenses are only used for their bearing in the apportionment of the common expenses between the passenger and freight train services, no further subdivision is necessary.

The freight expenses comprise chiefly the charges from the following departments:

Auditor of Merchandise Traffic.
Union and Empire Lines.
Freight Claim Agent.
Auditor of Coal Receipts.

The expenses of auditor of merchandise receipts were apportioned by the company to divisions of the system on the basis of merchandise earnings. The service performed by this department is, we believe, more closely related to the merchandise tons carried one mile, and we have, therefore, used this basis.

The Union and Empire Lines expenses were assigned to divisions on the basis of the earnings from these lines. As we were unable to compile any data that would more closely relate to the facts, the company's subdivision was accepted. These lines are engaged solely in merchandise service, and the expenses were apportioned to that commodity.

The expenses of the freight claim agent were apportioned by the company to divisions on the basis of freight earnings. It would seem, however, that the services of the freight claim agent are best measured in the ratio that the claims paid on a division bears to the loss and damage freight claims paid on the system which is the basis we have adopted both as between divisions and between commodities.

The expenses of the auditor of coal receipts, which also includes the accounting for coke, were apportioned by the company to the divisions of the system on the basis of the coal and coke earnings, whilst we have apportioned the expenses to divisions on the basis of the coal and coke ton miles, and to anthracite, bituminous coal and coke on the basis of the assigned maintenance, traffic and transportation expenses for those commodities.

The undivided expenses apportioned by the company to divisions on the basis of gross earnings can be fairly held to be a general overhead expense and accordingly, apportionable to the division and to commodities in proportion to the total charges for the maintenance, traffic and transportation expenses.

Account 109—Law Expenses.

A substantial part of the expenses was applicable to the system and apportioned by the company on the basis of gross earnings. We have regarded the item as a general overhead expense and distributed it accordingly.

Account 110—Insurance.

The expenses were assigned directly by the company to Road and Structures, Equipment and Transportation. In some cases a direct assignment was made to either the passenger or freight service. The undivided expenses, however, representing a substantial part of the whole, have been treated as a general overhead expense.

Accounts 111 to 114—Relief Department Expenses, Pensions, Printing and Stationery, and Other Expenses.

A large part of the expenses was assigned by the company directly to divisions and to either the passenger or freight service. The expenses common to the system were apportioned by the company to divisions on the basis of gross earnings whilst we have apportioned them on the same bases as mentioned for other general overhead expenses.

Of the expenses assigned to divisions we have apportioned the common items to passenger service and to freight service upon the basis of the dividend expenses of maintenance, traffic and operation.

The assignment to commodities was in turn made upon the basis mentioned for similar overhead expenses under general expenses.

Accounts 115 and 116—General Administration Joint Tracks, Yards and Terminal Facilities—Debit and Credit.

The expenses which were of a negligible amount were treated in the same way as other general overhead expenses.

TERMINAL COSTS IN PHILADELPHIA.

The expenses of maintaining its Philadelphia Terminal were charged by the Pennsylvania Railroad Company to the several divisions operating into Philadelphia, and the company made a direct assignment as between passenger and freight traffic of all but a relatively small amount of these expenses.

The common expenses assigned to each division have been distributed by us to passenger and freight traffic upon the bases used in distributing the corresponding expense accounts of the division.

The distribution of the terminal expenses assigned to freight service has been made to commodities upon the basis of the number of cars of each commodity handled in the terminal, except in a few cases where a more direct assignment to commodities was practicable.

In the Philadelphia & Reading Railway the accounts and statistics relating to the terminals in Philadelphia were not so complete, and it has been necessary, therefore, to apportion the expenses of the Philadelphia Division, including the terminals, amongst the divisions operating into Philadelphia. No separate assignment of terminal costs to commodities has been attempted in this case.

TAXES.

The cost of transporting all traffic must include the taxes paid in addition to the expenses charged to the operating expense accounts, and the problem of assigning a fair proportion thereof to the respective traffic services, presents many difficulties.

The taxes paid by the two companies involved in this investigation may be divided into:

Ad valorem Taxes—
    On the assessed value of real and personal property.
    On capital stock and loans outstanding.

Specific Taxes—
    On gross or net receipts.
    On property owned, not used in operation.

Internal Revenue Taxes—
    United States Government Corporation (Now Income Tax), but while the characteristics of each group appear to be widely dissimilar, a study thereof shows that the differences exist more in appearance than in fact, and that all taxes imposed by the governments as summarized above, may be placed in the one category.

All the real estate and personal property of railroads used for transportation purposes in the State of Pennsylvania, except in one or two cities, one of which is Philadelphia, is exempt from taxation, and the question naturally arises as to whether the taxes paid in that city should be considered as a burden to be placed on the traffic handled solely therein, or whether they should be spread over the entire transportation system. If the former method be adopted, then the total cost of handling traffic in the taxable limits of the state would be excessive, and the cost to a community just outside those limits proportionately low, although in the latter case, the shippers must obtain large benefits from the terminals in the city. The conclusion is, therefore, reached that the taxes paid on real estate and personal property on any part of the system should be deemed an expense of the whole and apportioned to the various divisions on some basis of fair measurement. That conclusion then requires that the taxes on property outside of the state be also included. The remaining class of taxes in the ad valorem class, those paid on the capital stocks and loans outstanding, is subject to the same arguments, as in reality the object taxed is the property represented by them.

The unit of measure for the reasonable distribution of the ad valorem taxes should be determined from the fair value of the properties employed and the extent of their use in the different services. In the absence of the information necessary to make such an apportionment, however, we have distributed these taxes as a general overhead expense in proportion to the total assignment of operating expenses. Whilst this method is clearly open to objection, it has been followed by the Wisconsin Commission and in other cases, and moreover there is no other readily available basis which could be considered to give more accurate results.

The specific taxes and internal revenue taxes, while measured to some extent by gross earnings, are mainly upon net earnings. In so far as they are based upon gross earnings, they might, with some degree of justice, be charged to the divisions and commodities producing the gross earnings. This treatment, however, would obviously be unfair in the case of taxes based upon net earnings, and in view of this and the further fact that so far as the present investigation is concerned the result is not materially influenced by any reasonable variation of method in dealing with this relatively small group of expenditures, we have decided to distribute them in the same manner as the other taxes.

Neither company made any separation of the taxes paid, and the only further point to be mentioned is that in the case of the Philadelphia & Reading Railway we calculated the cost on the taxes taken on the books of the company for the fiscal year ending June 30, 1913, in preference to those shown for the twelve months to May 31, 1913, the period decided on for all other expenses. This was done as the amount in this case is probably nearer the correct one than for the other twelve months' period.

HIRE OF EQUIPMENT—NET BALANCE.

The debits and credits to the account Hire of Equipment—Net Balance represent in the main the amounts paid to or received from foreign roads on a per diem basis for the use of equipment accepted or delivered, as the case may be, in the ordinary interchange of business. The expenditures or receipts on account of equipment operated under lease do not appear in this account. The net balance of Hire of Equipment account, therefore, should be included as a factor in cost determination.

The net balance in each company during the period selected for this investigation resulted in a very substantial credit, but a careful scrutiny of the items forming it disclosed that certain receipts had been credited to the account which for the purpose of this examination should be eliminated. These receipts consisted of amounts charged to affiliated companies for what may be termed the regular use of equipment, though on a per diem basis.

Neither company had made any attempt to assign the net balance either to divisions or to the various classes of traffic. The records were sufficiently clear so that no difficulty was encountered in assigning the amounts to passenger train service and freight train service respectively, but the apportionment of the latter service among the divisions calls for some comment.

The charges and credits assigned to the freight train service were in respect of—

- Locomotives (on Philadelphia & Reading Railway only);
- Freight Train Cars;
  - Private Car Lines;
  - Others.

The locomotive proportion was incurred in regular service on one division and was assigned thereto directly. The distribution of freight train cars may be made fairly on a car mile basis in the absence of specific data as the best obtainable relative unit to measure service.

The Hire of Locomotives has been assigned by us between the classes of freight traffic in the ratio of the train miles on the division that had the benefits of the locomotives.

As has been heretofore indicated in our comments on Maintenance of Equipment, there is a close connection between the amounts expended on Freight Train Car Renewals and Hire of Equipment, and

we have distributed the Hire of Freight Equipment on the car mile basis, which is the one used for the assignment of the Maintenance of Equipment—Freight Train Car Renewals.

CONCLUSION.

In the first section of this report (pages 1 to 9), we have endeavored to outline the general principles governing the determination of the transportation cost of a specific commodity, and in this section we have also summarized the results of this investigation in a brief statement of what we have found to have been the cost during the year ending May 31, 1913, of transporting anthracite from the principal mining districts in Pennsylvania to Philadelphia over the several routes upon the Pennsylvania Railroad and the Philadelphia & Reading Railway.

The second section (pages 9 to 18) discusses in considerable detail the records and statistical data used in our investigation and in the third (pages 19-52) we have shown at some length the methods adopted in applying the principles laid down in the earlier sections in measuring to the several services and especially to the anthracite service the proportion belonging thereto of the Operating Expenses, Taxes and Hire of Equipment.

The adoption of this arrangement has permitted the presentation in the first section of a concise but fairly complete statement of the intent and results of this inquiry, leaving to the other sections a study of the mass of details, a consideration of which is necessary to a full understanding of the conclusions we have reached. Throughout the report we have endeavored to make a full disclosure of processes followed and to indicate the reasons by which we have been guided in adopting certain plans and in rejecting others. We have refrained from an extended use of figures, but in the exhibits will be found the results of the apportionments of each primary account in the case of each railroad, and the statistical information presented can be readily supplemented to such extent as you may desire.

In general, it has been our aim to avoid the use of less closely related bases of distribution, even though sanctioned to some extent by previous usage, where statistics constituting a more closely related basis could be obtained by a reasonable amount of work in analyzing or combining figures available. In the case of the Pennsylvania Railroad a considerable amount of the information needed for more exact apportionments was available from the company's records or was compiled for our verification and use by the company's officials whose assistance we desire to acknowledge; and while in the case of the Philadelphia & Reading Railway such records and special compilations were not available to the same extent, this fact was not of as great importance as if the comparison of costs between the two companies had been the principal object in view. Comparisons of the results obtained by the methods employed in regard to the Pennsylvania Railroad, with the results which would have been obtained from the application to the figures of that company of the more general bases necessarily used in the case of the Philadelphia & Reading Railway, have given most valuable indications as to the degree of accuracy attained by the several methods.

The plan of procedure followed has entailed more work than the adoption of more general bases of apportionment. We believe, however, the increased work to have been fully warranted by the importance of the question involved both to the consumers of anthracite and to the railroads.

The whole problem of determination of costs for rate purposes is still in an early stage of development. Clearly one of the great objects to be sought is the establishment of a system of apportionment of costs which will combine in as great a degree as possible the features of simplicity, adaptability and accuracy. No such system can be evolved, however, until a series of exhaustive analyses has been carried out and the results collated. If then it shall be found that apportionments on certain broad lines on the basis of statistical data readily available gives substantially correct results under widely differing conditions, the task of determining costs in a given case will become a simple one. Until this has been done the adoption of such broad lines of apportionment without adequate tests of their fairness in specific cases may result in great injustice, and can hardly be deemed to be warranted where more exact or closely related bases are reasonably capable of establishment.

We trust, therefore, our investigation may be regarded as having accomplished its main purpose of presenting as accurate and impartial a statement as possible of the cost of transporting anthracite coal from the mines to Philadelphia, and may also have contributed something towards the solution of those difficult problems of cost determination which are of the greatest importance both to the railroads and to the community in general.

In conclusion we desire to express appreciation of the assistance which was given us by the officials and employees of the railroads in the course of our investigation.

Yours very truly,

PRICE, WATERHOUSE & CO.

EXHIBIT A.

PENNSYLVANIA RAILROAD COMPANY.

Summary of Operating Expenses, Taxes and Hire of Equipment on Divisions Affected by Transportation of Anthracite From Mining Districts to Philadelphia

For Year to May 31, 1913.

	Total.	Proportion assigned to all freight services.	Proportion assigned to anthracite service.
Operating Expenses:			
Maintenance of Way and Structures (Schedule A-1),	$9,032,425 92	$4,827,952 89	$481,864 29
Maintenance of Equipment (Schedule A-2), ...	13,317,615 81	8,909,377 63	1,014,914 30
Traffic expenses (Schedule A-3), ...	982,546 34	384,412 46	7,453 84
Transportation expenses (Schedule A-4), ...	24,584,732 02	17,078,652 10	1,679,856 43
General expenses (Schedule A-5), ...	1,917,414 61	1,183,788 43	100,448 12
Total operating expenses, ...	$49,834,734 70	$32,384,183 51	$3,284,536 98
Taxes, ...	2,718,190 75	1,765,257 42	173,541 80
Hire of equipment—Net balance (Freight Service proportion only), ...		114,334 96	13,960 18
Total operating expenses, taxes and hire of equipment, ...		$34,263,775 89	$3,472,038 96

Revenue ton miles of anthracite (2,240 lbs.), 1,091,882,612.

SCHEDULE A—1.

PENNSYLVANIA RAILROAD COMPANY.

Maintenance of Way and Structures of Divisions Affected by Transportation of Anthracite from Mining Districts to Philadelphia.

For Year to May 31, 1913.

	Total.	Proportion assigned to all freight services.	Proportion assigned to anthracite service.
Superintendence,	$412,034 26	$221,710 80	$26,709 62
Ballast,	236,372 63	108,542 66	9,993 76
Ties,	1,012,226 09	581,228 97	63,264 55
Rails,	363,956 13	190,269 28	21,613 63
Other track material,	628,478 61	340,062 53	33,165 37
Roadway and track,	2,864,211 80	1,580,302 21	164,675 45
Removal of snow, sand and ice,	55,420 94	30,049 29	3,239 87
Tunnels,	1,175 60	484 45	118 05
Bridges, trestles and culverts,	724,874 77	315,285 46	31,784 79
Over and under grade crossings,	96,815 08	42,877 63	4,440 22
Grade crossings, fences, cattleguards and signs,	93,480 20	47,893 98	6,045 55
Snow and sand fences and snowsheds,	413 62	267 85	31 06
Signals and interlocking plants,	797,238 54	331,112 00	25,288 68
Telegraph and telephone lines,	179,401 99	125,590 78	15,916 19
Buildings, fixtures and grounds,	1,234,828 17	533,764 83	46,505 31
Docks and wharves,	70,799 64	70,205 19	3,922 00
Roadway tools and supplies,	118,182 39	66,046 36	7,079 78
Injuries to persons,	4,617 97	2,272 32	277 79
Stationery and printing,	20,848 22	11,019 71	1,138 77
Other expenses,	5,517 58	3,305 49	424 90
Maintaining joint tracks, yards and other facilities, Dr.,	**505,131 32**	**333,682 66**	**26,052 84**
Maintaining joint tracks, yards and other facilities, Cr.,	*393,599 63*	*108,021 63*	*9,823 89*
Total maintenance of way and structures,	$9,032,425 92	$4,827,952 89	$481,864 29

SCHEDULE A—2.

PENNSYLVANIA RAILROAD COMPANY.

Maintenance of Equipment on Divisions Affected by Transportation of Anthracite from Mining Districts to Philadelphia.

For Year to May 31, 1913.

	Total.	Proportion assigned to all freight services.	Proportion assigned to anthracite service.
Superintendence,	$433,534 67	$284,430 45	$31,119 59
Steam locomotives—Repairs,	4,199,948 65	2,298,969 93	241,904 50
Steam locomotives—Depreciation,	908,838 01	489,579 78	42,715 57
Passenger-train cars—Repairs,	1,007,380 50	....	....
Passenger-train cars—Renewals,	5,085 72		
Passenger-train cars—Depreciation,	772,797 55		
Freight-train cars—Repairs,	4,384,885 97	4,384,865 97	531,611 55
Freight-train cars—Renewals,	341,155 58	341,155 58	41,442 05
Freight-train cars—Depreciation,	794,082 00	794,082 00	94,746 11
Floating equipment—Repairs,	515 27	515 27	31 12
Floating equipment—Depreciation,	16,500 00	16,500 00	996 60
Work equipment—Repairs,	90,722 27	62,192 29	5,607 07
Work equipment—Renewals,	3,839 36	2,319 50	257 80
Work equipment—Depreciation,	19,161 32	10,036 58	1,100 01
Shop machinery and tools,	319,819 26	202,862 58	12,102 15
Injuries to persons,	9,933 04	5,961 03	499 20
Stationery and printing,	58,864 33	39,357 19	3,715 18
Other expenses,	4,006 77	2,785 55	349 99
Maintaining joint equipment at terminals, Dr.,	**145,452 43**	**106,599 84**	**15,590 54**
Maintaining joint equipment at terminals, Cr.,	*198,886 89*	*132,835 91*	*8,874 73*
Total maintenance of equipment,	$13,317,615 81	$8,909,377 63	$1,014,914 30

SCHEDULE A—3.

PENNSYLVANIA RAILROAD COMPANY.

Traffic Expenses on Divisions Affected by Transportation of Anthracite from Mining Districts to Philadelphia.

For Year to May 31, 1913.

	Total.	Proportion assigned to all freight services.	Proportion assigned to anthracite service.
Superintendence,	$264,592 82	$144,015 37	$4,814 37
Outside agencies,	330,452 04	152,916 31	556 98
Advertising,	218,863 38	365 26	6 58
Traffic associations,	18,115 90	9,829 03	....
Fast freight lines,	13,810 21	13,810 21	....
Industrial and immigration bureaus,	27,856 41	4,031 75	....
Stationery and printing,	97,384 73	58,643 58	2,058 99
Other expenses,	11,470 85	800 95	16 92
Total traffic expenses,	$982,546 34	$384,412 46	$7,453 84

SCHEDULE A—4.

PENNSYLVANIA RAILROAD COMPANY.

Transportation Expenses of Divisions Affected by Transportation of Anthracite from Mining Districts to Philadelphia.

For Year to May 31, 1913.

	Total.	Proportion assigned to all freight services.	Proportion assigned to anthracite service.
Superintendence,	$910,845 66	$652,009 29	$75,208 55
Dispatching trains,	718,334 73	500,837 96	82,318 18
Station employes,	3,844,360 86	2,865,729 17	36,368 77
Weighing and car service associations,	18,198 91	18,198 91	....
Coal and ore docks,	119,651 67	119.651 67	16,260 66
Station supplies and expenses,	459,917 07	176,274 57	1,834 55
Yard masters and their clerks,	670,202 16	607,570 06	69,930 48
Yard conductors and brakemen,	2,395,401 50	2,179,054 52	230,102 21
Yard switch and signal tenders,	276,134 30	215,828 97	22,161 95
Yard supplies and expenses,	127,257 48	91,367 46	9,585 59
Yard enginemen,	1,104,681 36	987,069 59	105,447 52
Engine house expenses—Yard,	262,989 30	238,016 61	25,137 91
Fuel—Yard locomotives,	855,304 11	726,228 28	86,089 83
Water—Yard locomotives,	52,606 31	49,219 78	5,108 66
Lubricants—Yard locomotives,	16,825 47	15,125 69	1,695 53
Other supplies—Yard locomotives,	28,830 61	25,603 87	2,700 58
Operating joint yards and terminals, Dr.,	1,269,059 72	888,046 00	123,470 80
Operating joint yards and terminals, Cr.,	*1,564,318 57*	*911,458 13*	*65,681 63*
Road enginemen,	2,366,981 68	1,362,339 93	168,437 69
Engine house expenses—Road,	743,241 16	400,314 98	48,979 75
Fuel—Road Locomotives,	3,636,527 33	2,220,792 89	273,434 18
Water—Road locomotives,	328,778 31	205,820 48	18,200 81
Lubricants—Road locomotives,	67,565 40	34,773 48	4,224 04
Other supplies—Road locomotives,	97,094 02	55,243 99	6,587 72
Road trainmen,	2,856,497 74	1,732,804 11	203,382 81
Train supplies and expenses,	1,058,834 01	397,983 43	38,661 87
Interlockers and block and other signals—Operation,	388,368 17	168,219 64	13,828 16
Crossing flagmen and gatemen,	205,879 06	128,458 60	15,494 53
Drawbridge operation,	45,721 73	25,697 67	1,319 64
Clearing wrecks,	131,850 76	103,501 47	9,964 79
Telegraph and telephone—Operation,	322,363 41	204,711 54	22,337 43
Operating floating equipment,	5,863 57	2,205 28	92 10
Stationery and printing,	319,727 48	190,187 85	19,675 29
Other expenses,	41,901 48	25,931 56	2,192 10
Loss and damage—Freight,	308,188 93	307,976 68	1,521 39
Loss and damage—Baggage,	8,023 87	42 62	2 74
Damage to property,	17,405 29	11,508 87	1,074 75
Damage to stock on right of way,	3,346 23	2,293 17	237 71
Injuries to persons,	39,811 20	30,694 50	1,769 93
Operating joint tracks and facilities, Dr.,	58,187 91	36,938 53	3,366 74
Operating joint tracks and facilities, Cr.,	*33,709 37*	*14,163 44*	*2,669 88*
Total transportation expenses,	$24,584,732 02	$17,078,652 10	$1,679,856 43

SCHEDULE A—5.

PENNSYLVANIA RAILROAD COMPANY.

General Expenses on Divisions Affected by Transportation of Anthracite from Mining Districts to Philadelphia.

For Year to May 31, 1913.

	Total.	Proportion assigned to all freight services.	Proportion assigned to anthracite service.
Salaries and expenses of general officers,	$128,793 87	$84,445 94	$8,905 98
Salaries and expenses of clerks and attendants,	803,250 20	525,246 52	34,979 09
General office supplies and expenses,	114,523 62	73,627 42	7,324 96
Law expenses,	117,487 27	74,045 68	7,629 81
Insurance,	274,108 76	118,926 21	11,962 32
Relief Department expenses,	93,882 19	61,433 08	5,658 81
Pensions,	275,582 16	168,828 15	16,276 37
Stationery and printing,	78,860 03	54,864 30	5,577 76
Other expenses,	28,188 96	18,189 89	1,926 66
General administration joint tracks, yards and terminals, Dr.,	10,552 87	5,619.85	270 51
General administration joint tracks, yards and terminals, Cr.,	*7,815 32*	*1,438 61*	*64 15*
Total general expenses,	$1,917,414 61	$1,183,788 43	$100,448 12

EXHIBIT B.

PHILADELPHIA AND READING RAILWAY COMPANY.

Summary of Operating Expenses, Taxes and Hire of Equipment on Divisions Affected by Transportation of Anthracite From Mining Districts to Philadelphia

For Year to May 31, 1913.

	Total.	Proportion assigned to all freight services.	Proportion assigned to anthracite service.
Operating Expenses:			
Maintenance of way and structures (Schedule B-1),	$3,775,620 00	$2,624,332 00	$695,269 00
Maintenance of equipment (Schedule B-2),	6,235,206 00	5,114,637 00	1,553,108 00
Traffic expenses (Schedule B-3),	367,262 00	200,591 00	21,961 00
Transportation expenses (Schedule B-4),	12,718,056 00	9,836,200 00	1,995,928 00
General expenses (Schedule B-5),	574,405 00	441,936 00	106,038 00
Total operating expenses,	$23,670,549 00	$18,217,696 00	$4,372,304 00
Taxes (covering year to June 30, 1913),	1,004,229 00	772,862 00	185,503 00
Hire of equipment—Net balance (freight train proportion only),		236,957 00	79,169 00
Total operating expenses, taxes and hire of equipment,		$18,753,601 00	$4,478,638 00

Revenue ton miles of anthracite (2,240 lbs.), 1,232,259,733.

SCHEDULE B—1.

PHILADELPHIA AND READING RAILWAY COMPANY.

Maintenance of Way and Structures on Divisions Affected by Transportation of Anthracite from Mining Districts to Philadelphia.

For Year to May 31, 1913.

	Total.	Proportion assigned to all freight services.	Proportion assigned to anthracite service.
Superintendence,	$165,038 00	$111,521 00	$28,573 00
Ballast,	61,472 00	38,105 00	8,815 00
Ties,	597,439 00	422,739 00	107,183 00
Rails,	155,130 00	117,457 00	31,333 00
Other track material,	207,863 00	150,491 00	40,437 00
Roadway and track,	1,315,656 00	943,478 00	243,886 00
Removal of sand, snow and ice,	16,432 00	10,969 00	2,720 00
Tunnels,	19,790 00	13,191 00	2,640 00
Bridges, trestles and culverts,	300,401 00	179,525 00	34,433 00
Over and under grade crossings,	10,002 00	7,073 00	1,939 00
Grade crossings, fences, cattleguards and signs,	35,622 00	21,970 00	4,455 00
Snow and sand fences and snowsheds,	246 00	126 00	29 00
Signals and interlocking plants,	181,896 00	119,437 00	30,052 00
Telegraph and telephone lines,	11,464 00	9,664 00	2,497 00
Buildings, fixtures and grounds,	516,365 00	329,870 00	123,652 00
Docks and wharves,	76,942 00	76,942 00	12,731 00
Roadway, tools and supplies,	41,500 00	29,840 00	7,762 00
Injuries to persons,	3,656 00	2,[illegible] 00	691 00
Stationery and printing,	4,917 00	3,42[illegible]	905 00
Other expenses,	306 00	254 00	81 00
Maintaining joint tracks, yards and other facilities, Dr.,	**72,219 00**	**51,188 00**	**14,239 00**
Maintaining joint tracks, yards and other facilities, Cr.,	*18,736 00*	*15,530 00*	*3,784 00*
Total maintenance of way and structures,	$3,775,620 00	$2,624,332 00	$695,269 00

SCHEDULE B—2.

PHILADELPHIA AND READING RAILWAY COMPANY.

Maintenance of Equipment on Divisions Affected by Transportation of Anthracite from Mining Districts to Philadelphia.

For Year to May 31, 1913.

	Total.	Proportion assigned to all freight services.	Proportion assigned to anthracite service.
Superintendence,	$92,126 00	$75,638 00	$22,904 00
Steam locomotives—Repairs,	2,238,078 00	1,597,124 00	381,056 00
Steam locomotives—Renewals,	144,855 00	129,541 00	30,428 00
Passenger-train cars—Repairs,	365,733 00	....	....
Passenger-train cars—Renewals,	42,900 00	....	....
Freight-train cars—Repairs,	2,617,569 00	2,617,569 00	889,577 00
Freight-train cars—Renewals,	525,058 00	525,058 00	178,363 00
Work equipment—Repairs,	12,001 00	8,505 00	2,126 00
Work equipment—Renewals,	4,020 00	2,856 00	710 00
Shop machinery and tools,	182,853 00	150,126 00	45,457 00
Injuries to persons,	3,061 00	2,513 00	760 00
Stationery and printing,	7,537 00	6,185 00	1,871 00
Other expenses,	585 00	478 00	144 00
Total maintenance of equipment,	$6,235,206 00	$5,114,637 00	$1,553,108 00

SCHEDULE B—3.

PHILADELPHIA AND READING RAILWAY COMPANY.

Traffic Expenses on Divisions Affected by Transportation of Anthracite from Mining Districts to Philadelphia.

For Year to May 31, 1913.

	Total.	Proportion assigned to all freight services.	Proportion assigned to anthracite service.
Superintendence,	$126,600 00	$78,896 00	$8,162 00
Outside agencies,	77,606 00	39,916 00	....
Advertising,	68,479 00	....	....
Traffic associations,	6,287 00	3,457 00	....
Fast freight lines,	51,266 00	51,266 00	....
Stationery and printing,	37,024 00	27,056 00	13,799 00
Total traffic expenses,	$367,262 00	$200,591 00	$21,961 00

SCHEDULE B—4.

PHILADELPHIA AND READING RAILWAY COMPANY.

Transportation Expenses on Divisions Affected by Transportation of Anthracite from Mining Districts to Philadelphia.

For Year to May 31, 1913.

	Total.	Proportion assigned to all freight services.	Proportion assigned to anthracite service.
Superintendence,	$229,372 00	$186,575 00	$36,332 00
Dispatching trains,	174,070 00	130,939 00	27,753 00
Station employes,	1,636,440 00	1,358,976 00	84,169 00
Weighing and car service associations,	2,204 00	2,204 00	....
Coal and ore docks,	213,039 00	213,039 00	85,214 00
Station supplies and expenses,	177,635 00	83,429 00	5,452 00
Yard masters and their clerks,	208,979 00	202,470 00	44,501 00
Yard conductors and brakemen,	1,069,165 00	1,011,728 00	204,972 00
Yard switch and signal tenders,	26,419 00	25,344 00	4,912 00
Yard supplies and expenses,	38,107 00	31,671 00	6,927 00
Yard enginemen,	526,054 00	500,030 00	95,977 00
Engine house expenses—Yard,	151,619 00	145,043 00	26,514 00
Fuel—Yard locomotives,	492,449 00	466,981 00	85,013 00
Water—Yard locomotives,	19,903 00	18,202 00	3,785 00
Lubricants—Yard locomotives,	8,562 00	8,017 00	1,450 00
Other supplies—Yard locomotives,	15,468 00	14,806 00	2,757 00
Operating joint yards and terminals, Dr.,	74,871 00	68,614 00	13,825 00
Operating joint yards and terminals, Cr.,	*10,266 00*	*9,963 00*	*1,681 00*
Road enginemen,	1,500,064 00	1,107,328 00	257,647 00
Engine house expenses—Road,	460,334 00	275,400 00	67,430 00
Fuel—Road locomotives,	2,360,897 00	1,665,407 00	395,828 00
Water—Road locomotives,	92,498 00	68,168 00	15,985 00
Lubricants—Road locomotives,	55,292 00	35,870 00	8,632 00
Other supplies—Road locomotives,	66,006 00	49,656 00	11,276 00
Road trainmen,	1,816,820 00	1,380,637 00	332,783 00
Train supplies and expenses,	332,178 00	101,878 00	32,009 00
Interlockers and block and other signals—Operation,	294,737 00	162,093 00	41,723 00
Crossing flagmen and gatemen,	154,266 00	89,205 00	18,804 00
Clearing wrecks,	49,319 00	49,301 00	12,528 00
Telegraph and telephone—Operation,	78,065 00	64,686 00	16,914 00
Stationery and printing,	91,241 00	70,424 00	14,258 00
Other expenses,	12,058 00	9,006 00	2,007 00
Loss and damage—Freight,	161,940 00	161,940 00	22,559 00
Loss and damage—Baggage,	74 00	....	....
Damage to property,	58,150 00	49,312 00	11,320 00
Damage to stock on right of way,	2,942 00	505 00	119 00
Injuries to persons,	70,198 00	34,124 00	5,343 00
Operating joint tracks and facilities, Dr.,	17,425 00	12,099 00	2,937 00
Operating joint tracks and facilities, Cr.,	*10,390 00*	*8,944 00*	*2,046 00*
Total transportation expenses,	$12,718,056 00	$9,836,200 00	$1,995,928 00

SCHEDULE B—5.

PHILADELPHIA AND READING RAILWAY COMPANY.

General Expenses on Divisions Affected by Transportation of Anthracite from Mining Districts to Philadelphia.

For Year to May 31, 1913.

	Total.	Proportion assigned to all freight services.	Proportion assigned to anthracite service.
Salaries and expenses of general officers,	$64,928 00	$49,955 00	$11,987 00
Salaries and expenses of clerks and attendants,	295,443 00	227,307 00	54,538 00
General office supplies and expenses,	22,514 00	17,322 00	4,156 00
Law expenses,	55,019 00	42,330 00	10,157 00
Insurance,	3,860 00	2,972 00	712 00
Relief Department expenses,	24,891 00	19,151 00	4,596 00
Pensions,	77,279 00	59,456 00	14,265 00
Stationery and printing,	23,209 00	17,857 00	4,285 00
Other expenses,	7,349 00	5,654 00	1,358 00
General administration—Joint tracks, yards and terminals, Cr.,	87 00	68 00	16 00
Total general expenses,	$574,405 00	$441,936 00	$106,038 00

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END OF
TITLE